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Promoting Economic Incentives for Environmental Protection in the Surface Mining Control and Reclamation Act of 1977: An Analysis of the Design and Implementation of Reclamation Performance Bonds

INTRODUCTION

Although often adopted at the national level, many environmental laws have provided for state modification and implementation. This practice is likely to continue and has taken on a greater importance in the Reagan administration in its effort to promote state involvement in the regulatory process. The Surface Mining Control and Reclamation Act of 1977 (SMCRA) permits states to regulate surface mining provided that the states satisfy certain conditions. One provision of the act establishes a reclamation bonding requirement intended to ensure that post-mining reclamation is completed by coal operators or that sufficient funds are available to the state to complete the necessary reclamation work should the operator fail to do so. This provision is implemented at the state level. If designed and administered properly, reclamation bonding can serve as an economic incentive for environmental protection.


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3. Id. § 1253.

4. Id. § 1259.

5. Id. § 1259(a). This section provides that a permit applicant must file a bond with the regulatory authority, which would be the state if the state has an approved program for implementing SMCRA under § 1253.
Like other forms of economic incentives, the bonding requirements offer an alternative to traditional regulation of economic activity by command and control techniques. In the traditional types of regulation, the appropriate agency promulgates operating and performance standards, often stipulates the design and operation of a preventive device or procedure, and inspects the activity to ensure proper compliance. Economic-based incentive regulations, on the other hand, provide more flexibility to a production decisionmaker by allowing a variety of production techniques so long as the techniques satisfy certain performance standards. The decisionmaker is free to choose the preferred alternative among those which satisfy the requirements. While economic-based incentives are relatively recent in the annals of regulatory history, they have been discussed by economic theorists for quite some time. In part, their recent rediscovery is a response to the apparent political outcry for deregulation of the American economy.

This article examines the bonding system designed by the Surface Mining Control and Reclamation Act of 1977 (SMCRA) and some alternatives developed by several states in their regulatory programs. As well, this article evaluates the systems for their potential to provide economic incentives for coal operators to engage in environmentally sound mining techniques throughout the duration of the mining activities. The first section of this article briefly reviews the SMCRA. The second section outlines the specific reclamation bonding provisions of the act. The third section analyzes economic incentives and their application to coal mining, and the fourth section more particularly evaluates the reclamation bonding provisions of the act as market based incentives. Finally, the article assesses the design of reclamation bonds and suggests modifications intended to provide greater incentives for coal producers to protect the environment.

**THE SURFACE MINING CONTROL AND RECLAMATION ACT**

The federal SMCRA of 1977 was signed into law by President Jimmy Carter after a seven-year congressional debate, which included two vetoes by President Ford. The act is a complex piece of legislation that estab-

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10. For a brief summary of the legislative history of SMCRA, including these vetoes, see 2 P.C. McGIMLEY & D. VISH, COAL LAW AND REGULATION § 40.03 (1983). For a more thorough discussion of the extensive legislative history of SMCRA see Note, A Summary of the Legislative History of the Surface Mining Control and Reclamation Act of 1977 and the Relevant Legal Periodical Literature, 81 W. VA. L. REV. 775 (1979).
lishes a major federal role in the development and enforcement of a national policy to regulate surface mining. SMCRA states two principal goals: (1) to protect the nation from the adverse social and environmental impacts associated with coal mining, and (2) to assure the production of coal to meet the nation’s energy needs. The act, therefore, attempts to strike a balance between the often competing goals of environmental protection and energy production.

Like other environmental problems, surface mining activity creates ecological disruptions that the coal operator cannot completely prevent or confine to the mining site. The resulting externalities include acid runoff into surrounding streams and rivers, loss of wildlife habitat, land subsidence affecting surrounding property owners, and the loss of the aesthetic value of the virgin land due to deforestation, changed contour, and erosion. Controlling these externalities is more difficult because these environmental effects are not always immediately apparent until years after mining operations have been completed.

Historically, the coal mining industry has consisted of both large, ongoing mining corporations and small, short-term coal operators. The regulation of mining activity has been difficult because of the ease with which coal operators enter and leave the industry. Often the pace of the regulatory process exceeds the duration of a coal operator’s existence. A traditional argument for federal regulation of coal mining has been that the federal government is more capable of dealing with the quick entry and exit of coal operators and that state regulations are too easily ignored and circumvented by powerful coal industry groups within a state. On the other hand, state regulation is often considered more desirable because it is consistent with the traditional state functions of land use regulation and because it allows for geological and geographic differences among states. Ideally, federally adopted and imposed standards allowing for state modification and implementation should achieve more efficient and effective surface mining regulation.

SMCRA, like other problem-specific environmental statutes, assigns the responsibility for environmental destruction to the party undertaking the related production activity. In addition to outlining regulatory pro-

12. There exists quite a large literature on the environmental effects of surface mining. For a good general discussion of environmental impacts, see Brooks, Strip Mine Reclamation and Economic Analysis, 6 Nat. Res. J. 13 (1966).
procedures for mining permits, SMCRA requires coal operators to prevent environmental destruction and to restore the land after mining activity has been completed.\textsuperscript{15} SMCRA also establishes operator liability for correcting damage to the environment\textsuperscript{16} and allows citizens, as well as the regulatory authority, to initiate a civil action to compel compliance with the act.\textsuperscript{17} Furthermore, the statute preserves citizens' rights to engage in litigation based on nuisance or negligence principles of common law doctrine to recover personal damages.\textsuperscript{18} Thus, SMCRA statutorily grants the public the right to be protected from certain types of resulting environmental harm.

The SMCRA is quite broad and inclusive. It regulates surface coal mining activities\textsuperscript{19} from site preparation and construction, through mining operations, and through final reclamation of the disturbed land. Title V of the act establishes the regulatory program containing explicit requirements for permit applications and conditions and procedures to be followed in issuing mining permits.\textsuperscript{20} Further, the statute itself sets out detailed performance standards to be met, including restoration of land to its approximate original contour, stabilization of surface areas, segregation and preservation of topsoil, restrictions on water impoundments, protection of the hydrologic balance, regulation of waste disposal and excess spoil, control of the use of explosives, establishment of revegetation, and consideration of post-mining use of land.\textsuperscript{21} Additionally, SMCRA contains provisions for mining unique areas such as steep slopes\textsuperscript{22} and prime farmland.\textsuperscript{23} To assure compliance with these performance standards, SMCRA establishes an enforcement mechanism providing for periodic inspections of mine sites, for monitoring of activities and for the

\textsuperscript{15} Mining permits are required for all persons engaging in coal mining activities. 30 U.S.C. § 1256 (1982). Permits are more than notification to a government agency that mining is occurring, however. SMCRA is rather detailed about how the mining is to be conducted in order to protect the environment during mining and return it to its original condition after mining is completed. \textit{Id. §§1257-58, 1262, 1265-66.}

\textsuperscript{16} The act establishes an extensive enforcement program based upon mine-site inspections and monitoring by the regulatory authority. \textit{Id §1267 (1982).} Operators are penalized for violations, \textit{id. §1268; are required to correct the violations, id. §1271(a)(2) & (3); and, in the most severe instances, must cease operations until the violation is corrected. \textit{Id. §1271(a)(2).} For a complete summary of SMCRA's enforcement mechanisms, see 2 McGINLEY & VISH, supra note 10, at §47.01.

\textsuperscript{17} 30 U.S.C. § 1270 (1982). This section allows citizens to initiate such lawsuits after a sixty-day notice to the Secretary of the Interior, the state, and the alleged violator, and providing that neither the secretary nor the state has already commenced an action. If the secretary or the state has commenced an action, the statute grants citizens the right to intervene.

\textsuperscript{18} \textit{Id. §1270(7).}

\textsuperscript{19} The Act regulates not only activities in connection with surface coal mining, but also surface operations and surface impacts incident to an underground mine, \textit{id. §1291(28), and certain coal exploration operations which "substantially disturb" the land surface. \textit{Id. §1262.}}

\textsuperscript{20} \textit{Id. §§1256-64.}

\textsuperscript{21} \textit{Id. §§1265-66.}

\textsuperscript{22} \textit{Id. §1265(d).}

\textsuperscript{23} \textit{Id. §1265(b)(7).}
imposition of both civil and criminal penalties for violations of the act.\textsuperscript{24} Finally, SMCRA creates an Abandoned Mines Reclamation program to reclaim sites abandoned prior to the enactment of the act.\textsuperscript{25}

Congress specified two provisions in the act that were to reduce federal involvement in surface mining supervision in exchange for state regulation. First, Congress created the Office of Surface Mining, Reclamation, and Control (OSM) in the Department of the Interior\textsuperscript{26} and gave OSM the responsibility for designing and establishing the regulatory program.\textsuperscript{27} Second, Congress required OSM to implement surface mining regulation in two phases over a three-year period. In the first phase, the interim phase, the federal OSM had the primary responsibility for enforcing the law while states were preparing their own programs.\textsuperscript{28} In the second phase, the states have primary enforcement responsibility for the permanent program.\textsuperscript{29} Individual states could choose not to participate in phase two. If a state chooses not to participate, or if it fails to gain federal approval of its program, then OSM must enforce the federal program in that state.\textsuperscript{30}

By January 1981, when the Reagan Administration took office, eleven of the twenty-four largest coal producing states had received either complete or conditional approval for their regulatory programs.\textsuperscript{31} The real-
ization of "primacy," or self-regulation, for all states that desired it, became a major goal of OSM under the Reagan Administration and by July 1982, that goal was achieved. Those states now have the authority to implement their own programs which must address all phases of mining activity from permit application review through performance standards enforcement and completion of reclamation in accordance with an approved pre-mining plan.

Under the permanent program, OSM remains active in several aspects of surface coal mining regulation. OSM continues to perform two functions relevant to the discussion of reclamation bonding as an economic incentive: (1) promulgation of federal rules to implement the act and (2) oversight of the operation of state programs. First, OSM's responsibility for coordination and unification of regulations continues. The agency, however, has chosen to use this rulemaking authority to reduce national uniformity of mining requirements and to provide more flexibility and more options to the states. OSM has completed an extensive revision of the permanent program regulations upon which the states base their own regulatory program. Second, OSM's enforcement role has changed from that of primary enforcer to overseer. In its oversight capacity, OSM provides technical support to the states in addition to evaluating the operation of state programs.

SURFACE MINING RECLAMATION PERFORMANCE BONDS

Under the provisions of SMCRA, OSM has the responsibility of establishing a federal bonding system, and of evaluating and monitoring

32. The goal of achieving primacy for all major coal producing states was well known to OSM personnel, state agencies, and the mining industry during 1981 and 1982. All matters related to that goal were given highest priority. The goal was consistent with President Reagan's statements concerning the return of decisionmaking power to the states.


34. The current administration's effort to give more flexibility to the states is reflected in numerous public statements by OSM including press releases, congressional testimony, and explanations of rule changes. See e.g., Final Environmental Impact Statement, OSM-EIS-1 Supplement, Vol. 1 at S-3 (Jan. 1983).

35. OSM began to rewrite these regulations on a case-by-case basis in early 1981. The revision was considerably delayed because of environmentalists' challenges in National Wildlife Federation v. Watt, No. 82-0320 (D.D.C. filed Feb. 3, 1982), which resulted in a new Environmental Impact Statement addressing the total impact of the revision. Final Environmental Impact Statement, OSM-EIS-1: Supplement (Jan. 1983). See also discussion, infra note 49. The majority of the revised regulations became effective in July 1983, 48 Fed. Reg. 32959 (1983), but modifications have been made since that time and are continuing. In response to a recent court order with respect to an agreement between the parties, In Re Permanent Surface Mining Regulations, No. 79-1144, regulations pertaining to several controversial areas have been suspended. 50 Fed. Reg. 257 (1985).

36. A reorganization of OSM completed in 1982 established two technical support centers, one in Pittsburgh to serve the eastern states and one in Denver to serve the western states. Also, OSM has field offices in nearly every coal mining state to coordinate federal-state relations.
the bonding systems implemented by each state.\textsuperscript{37} The SMCRA requires that before a new or renewed permit to conduct surface coal mining and reclamation operations is issued, the coal operator must file a performance bond\textsuperscript{38} with the regulatory authority.\textsuperscript{39} The bond is a sum of money deposited as a guarantee against the failure to cure environmental damage resulting from mining.

Coal mining bonds are usually submitted to the regulatory authority through a third-party surety using some form of the permittee's property as security. Businesses with substantial assets may be able to self-bond under very limited conditions.\textsuperscript{40} If the operator fails to complete the required reclamation work on the mine site, the operator will forfeit the bond, and the state will use the money to complete the work.\textsuperscript{41} A bond which is insufficient to cover all probable reclamation costs is not an effective tool for protecting the environment.

Section 509 of SMCRA contains specific provisions regarding the area to be bonded, the amount and form of the bond, and the extent of liability.\textsuperscript{42} Federal regulations implementing the act provide further detail about the specific requirements.\textsuperscript{43} Although most states have patterned their bonding program directly on the federally designed one, several states\textsuperscript{44} have opted to take advantage of the act's provision that "in lieu of the establishment of a bonding program, as set forth in (Section 509), the Secretary may approve as part of a state or federal program an alternative system that will achieve the objectives and purposes of the bonding program pursuant to (Section 509)."\textsuperscript{45} OSM's policy under the current administration has been to allow the states maximum flexibility in the establishment of their regulatory programs and the agency, therefore, has not discouraged the use of alternative bonding systems. As

\textsuperscript{38} Coal mining bonds are not unlike bail bonds posted by criminal defendants to guarantee their later appearance in court. In such cases if a bond is set, for example, at $10,000, the defendant must either deposit that sum in cash with the court, and have it returned upon his appearance in court, or must pay a third party bondsman to guarantee that amount to the court. If the defendant fails to appear, the defendant's own deposit, or the bond provided by the private bondsman, is forfeited. The bondsman then attempts to collect the forfeited bond from the defendant or deliver the defendant to the court at which time the bondsman's deposit is returned.
\textsuperscript{40} Id. § 1259(c); 30 C.F.R. § 800.23 (1984).
\textsuperscript{41} 30 C.F.R. § 800.50 (1984).
\textsuperscript{44} According to information provided by OSM in September, 1983, six states including Indiana, Missouri, Ohio, Pennsylvania, Virginia, and West Virginia have selected this option. For a discussion of the alternative selected by these states, see infra text accompanying notes 89-122.
\textsuperscript{45} 30 U.S.C. § 1259(c) (1982).
discussed in more detail infra, the primary difference between the alternative bonding systems and SMCRA is the source of funds for reclamation when the operator defaults. 46 States have otherwise patterned the alternative bonding systems substantially after the bonding system provided by SMCRA. 47

The first aspect of bonding specifically addressed in SMCRA is the geographical area to be bonded. The bond system designed by the federal law anticipates that the bond will cover actual operations within the permit area during the initial time of the permit and specifically allows for incremental bonding, or additional bonding, as succeeding increments of operations are conducted within that permit area. 48 Recently promulgated regulations revising the federal bonding system provide for three forms of bonds with respect to the area covered: (1) bonding which covers the entire permit area, (2) cumulative bonding which covers only the area initially mined and then which increases as operations expand, and (3) incremental bonding which allows separate bonds for separate sections of the permit area. 49

The first form of bond requires the operator to obtain a bond in an amount sufficient to cover all reclamation work on the entire permit site. 50 Because permits often cover large areas, with actual operations intended to extend for a long period of time, this type of bond will be costly and must, at a minimum, match the duration of the operations. Sureties might be hesitant to issue such extensive bonds due to the risky nature of the mining industry. 51 The alternative forms of bonds attempt to make it easier for companies to obtain bonds. 52

46. See infra notes 90-94 and accompanying text. Briefly, the system contemplated by SMCRA establishes the individual operator, or the operator’s bond upon default, as the exclusive source of funds for reclamation, whereas these alternative state systems rely only partially on the operator and then plan to supplement that source with a state fund consisting of money collected from all operators.


49. 30 C.F.R. § 800.11(d) (1984). Several portions of these revised regulations were remanded by Judge Flannery in In Re: Permanent Surface Mining Regulation Litigation, 21 Envt. Rep. Cas. (BNA) 1724, 1742-44 (D.D.C. 1984). The court found that regulations that would allow the operator to post a bond for an area smaller than the entire area to be mined in a permit term, 30 C.F.R. § 800.11(b), and regulations pertaining to phased bonding, id. § 800.13(a)(2), are contrary to the act and its legislative history. In response to the court’s order, OSM has suspended the regulations effective March 25, 1985. 50 Fed. Reg. 7274 (1985).


51. As a result primarily of land acquisition and equipment purchases or leases, the market entrance costs to coal mining are high. For a variety of reasons, including market fluctuation, the success rate, particularly for small companies, is low. In recent years the mining industry has been plagued with bankruptcies of small operators. For a thorough analysis of the financial aspects of the coal industry, see W.A. ROSENBAUM, COAL AND CRISIS: THE POLITICAL DILEMMAS OF ENERGY MANAGEMENT (1978). See also, Pa. Dept. Envt. Resources, Office of Policy, “An Analysis of Pennsylvania’s Surface Mining Bond Forfeiture Program” 34, 36 (1984) which asserts that higher bond amounts have an adverse impact on an already financially hurting mining industry.

Under cumulative bonding,\(^5^3\) for example, the bond posted at any one
time covers only those permit areas actually being disturbed.\(^5^4\) An initial
bond is set and a schedule planned for increasing that single bond as
operations expand.\(^5^5\) Under incremental bonding,\(^5^6\) on the other hand, separate bonds are posted for separate areas within the permit area.\(^5^7\) The
interpretation of incremental bonding has been controversial since the
first permanent rules were published in March 1979.\(^5^8\) The source of
the controversy concerns whether a bond for one increment can or should be
forfeited to complete reclamation on another increment.\(^5^9\) The revised
regulations do not allow such forfeiture. However, concern about the
adequacy of such bonds to ensure protection of the entire permit area
remains.

The amount of the bond is another aspect covered specifically in SMCRA’s
proposed bonding system. Section 509(a) sets a minimum of $10,000 for
the bond for the entire area under one permit.\(^6^0\) The actual bond amount
is determined by the regulatory authority and must according to the stat-
tutes be based on the following factors:

1) Reclamation requirements of the approved permit;

2) Probable difficulty of reclamation, including the consideration
of topography, geology, hydrology, and revegetation potential;

3) Amount necessary to assure completion of the reclamation proj-
ect in the event of forfeiture.\(^6^1\)

The revised federal regulations echo the statutory language, adding
only that the bond amount should be based on the estimated cost submitted
by the permit applicant.\(^6^2\) Because the permit term is several years (usually
five) and reclamation work is ongoing during and after that period, cost
estimates must include projected increases in order to accurately reflect
the real cost to the operator or to the regulatory authority. OSM however,
deleted the requirement that the regulatory authority consider historical
cost charges for similar reclamation work.\(^6^3\) Instead, the revised regu-
lations direct the states to inquire into the “sufficiency” of the bond amount

\(^{54}\) Cumulative bonds are not defined by OSM regulations but are discussed in the Preamble, supra note 52.
\(^{55}\) Id.
\(^{56}\) 30 C.F.R. § 800.11(b)(1984). This section has been suspended pursuant to a court order. See
discussion supra note 49.
\(^{57}\) See, id. § 800.11(b); see also Preamble, supra note 52.
\(^{58}\) See discussion in Preamble, supra note 52.
\(^{59}\) Id.
\(^{61}\) Id.
when initially requiring adequate bonds. The regulations also allow the regulatory agency to adjust the amount of the bond as the area covered or costs of reclamation change. Bond adjustment, however, is a relatively burdensome procedure administratively, requiring a determination of change by the agency, notification to the parties, and an informal conference. Consequently, such changes are not likely to occur. Consideration of cost changes at the initial stages of review is a more certain way of achieving true cost estimation.

The third aspect of SMCRA's bond system is the duration of liability. The act provides only that the liability exists for the duration of the operation and until the operator's responsibility for establishing revegetation has expired (usually five years after seeding). The agency has promulgated regulations which again will, in all likelihood, make it easier for operators to obtain bonds. First, OSM has introduced the concept of phase bonding as a "possible solution to objections from the surety industry to the extensive length of time a performance bond must be held."

Under the phase bonding system created in the revised regulations, a state regulatory authority may approve bonds from different sources covering the various phases of reclamation work. SMCRA provides for the release of performance bonds in three phases according to the following schedule: in Phase I, sixty percent of the bond may be released after backfilling, regrading, and drainage control is completed; in Phase II, additional bond may be released after other reclamation activities are complete, including establishment of revegetation (provided a sufficient amount is withheld to allow reestablishment of revegetation by a third party up to five to ten years later); in Phase III, the bond is fully released upon completion of all reclamation work and after all operator responsibility has expired. Thus, an operator could obtain a surety bond applicable only to the first phase of reclamation work and then use a collateral bond for the remaining phases. This would allow sureties to avoid the

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64. 30 C.F.R. § 800.14(b) (1984). This section specifies that "the amount of the bond shall be sufficient to assure the completion of the reclamation plan if the work has to be performed by the regulatory authority in the event of forfeiture..." This language clearly does not preclude the consideration of historical cost changes, but in the absence of a specific directive to do so, such consideration may easily be overlooked or ignored.

65. Id. § 800.15.

66. Id.


68. Preamble, supra note 52, at 32,938.

69. 30 C.F.R. § 800.13(a)(2) (1984). This section has been suspended pursuant to a court order. See supra note 49.

70. 30 U.S.C. § 1269(c) (1982). This section has been suspended pursuant to a court order. See supra note 49.

71. Collateral bonds are bonds executed by the permittee and supported by the deposit of such items as cash, negotiable bonds, certificates of deposit, letters of credit, or certain security interests. 30 C.F.R. § 800.5(b)(1984).
five to ten-year period of operator responsibility for establishment of revegetation.\textsuperscript{72}

Several persons commenting on the proposal to allow phase bonding challenged its legality as well as its effectiveness in achieving reclamation.\textsuperscript{73} SMCRA refers only to incremental bonding as it applies to the extent of surface coal mining and reclamation operations\textsuperscript{74} and makes no mention of separate bonding for time intervals. More importantly, there are significant questions about the actual operation of phase bonding. For example, one problem arises when there is failure of reclamation completed in Phase I after bond for the period has been released.\textsuperscript{75} If one bond covers all phases of reclamation, even though some portion of the bond is no longer available because it has been released, the remainder of the bond would still be available to complete satisfactorily the Phase I work. The guarantor of the bond would remain liable for all portions of reclamation. If, on the other hand, there are separate bonds for the various phases and the first phase fails after release of the applicable bond, the remaining bond is not available for use except for work on Phases II and III. The surety for Phase I no longer retains liability. Introduction of this new concept arguably merely complicates issues of liability and does nothing to further the achievement of timely and successful reclamation work.

A second way in which the revised regulations go beyond the specific terms of the act is in allowing portions of the permit area requiring extended liability to be separated from the original area and bonded separately. Under OSM's regulations, when some portions of the bonded area require extended liability, these specific portions can be identified and segregated from the remaining area for which bond will be released.\textsuperscript{76} Precautions are included in the regulation to assure that such areas are isolated, clearly defined, limited, and do not constitute a scattered, intermittent, or checkerboard pattern of failure.\textsuperscript{77} Potential difficulties remain, however, in assuring sufficient funds to complete reclamation. Also, the remaining reclamation problem, for which extended liability is necessary, may expand into areas previously successfully reclaimed. This

\textsuperscript{72} The operator retains responsibility for successful revegetation for five years after the last year of seeding, fertilization, irrigation, or other work, except that in dry areas the responsibility extends for ten years. 30 U.S.C. § 1265(b)(20) (1982).

\textsuperscript{73} Preamble, supra note 52, at 32,938 & 32,941.

\textsuperscript{74} 30 U.S.C. § 1259(a) (1982).

\textsuperscript{75} Problems with the initial steps in reclamation, for example drainage control, can be recurring after a few seasons. Although before a phase bond is released the regulatory authority will have made some determination that the reclamation is adequate, the very nature and intent of the phase bond system allows this to occur early in the reclamation process. As later reclamation occurs, some corrective action may be necessary with respect to the early phases.

\textsuperscript{76} 30 C.F.R. § 800.13(b) (1984).

\textsuperscript{77} Id.
concern would be alleviated if the regulations prohibited segregation of areas requiring extended liability when poor water quality, erosion, or other potentially expansive reclamation problems exist. Thus, for at least the most commonly recurring and potentially expansive environmental problems, none of the bond would be released until complete reclamation is achieved. This would assure the availability of adequate funds for reclamation. Efforts to release bond money early at the cost of long term environmental protection are inconsistent with the goals of SMCRA.

ECONOMIC-BASED ENVIRONMENTAL POLICY TOOLS

Over the past two decades a rather large literature has accumulated designing and proposing the use of economic incentives to encourage environmentally sound behavior. These market-based incentives are promoted as an alternative to direct governmental regulation and they are designed to be more efficient and administratively easier to implement than the traditional promulgation and inspection type of regulation. Despite the theoretical elegance of economic incentives, policy-makers in general have not matched the enthusiasm of economists and environmental policy analysts for economic-based policy tools. Recently, however, there appears to be a rejuvenation of interest in market-based incentives.

The logic underlying economic-based policy tools is quite simple: since prices allocate scarce privately-owned resources, they can also be used to allocate scarce publicly-owned resources. The publicly-owned resource, in this case, is the quality of the environment which we all collectively share. Theoretically, a firm generating environmental damage should be billed the total social costs of that damage. The tax, fee, charge, or levy, therefore, forces the producers of externalities to consider social costs in making production decisions. The price charged, moreover, should cover the social cost of damage to the publicly-owned resources.

There are two difficulties incurred in approximating social valuations of environmental goods. First, public goods like the environment are so diffuse and amorphous that they are difficult to confine for description.

78. For a general discussion of economic incentives, see Anderson and Baumol & Oates, supra note 7.
79. This interest is evidenced by the Environmental Protection Agency’s initiation of emission offset programs and the consideration of the bubble concept for regulating air emissions in a geographic region. For a discussion of these and other innovative economic-based incentives, see Blackman & Baumol, Modified Fiscal Incentives in Environmental Policy, 56 LAND ECON. 417 (1980).
80. See generally Baumol & Oates, supra note 7.
81. According to economic theory, these publicly-owned resources are public goods. Public goods are resources or commodities that cannot readily be packaged in order to exclude their use by consumers who do not contribute to their provision. Examples of public goods are air quality, national defense, scenic vistas, and public health. See id.
Landscapes and scenic vistas, for example, are not easily described to citizens or policy makers asked to evaluate them. Second, measuring collective preferences—the value a group of individuals places on a publicly-owned good—has proven quite challenging. Economists and other policy analysts generally agree that willingness to pay should be the central concept in calculating value, but find it difficult to design effective estimation techniques. The preferred method of cost estimation is a valuation of the foregone benefit to society as a result of the externalities produced. A simplified method of cost estimation focuses on the cleanup costs of the emissions, and then allocates the total cost proportionately to each emitter. Using this method, the decision of whether to expend scarce resources to clean up environmental damages implicitly considers the willingness to pay and the social value of an environmental resource, but does not explicitly calculate the social value of the environmental resource that is to be protected.

The calculation of the value of social resources affected by a producer is very difficult in practice. In simple cases of air and water pollution it is relatively easy to estimate the appropriate cost, but in most realistic environmental problem situations such calculations are very complex. For example, plant emissions into air and watersheds can be monitored and measured rather accurately, and a per unit emission charge can be levied on the producer. For instance, the social costs of the discharge from the Reserve Mining Corporation in Minnesota into Lake Superior were estimated as stemming mainly from lake eutrophication, the increased need for water filtration, and the creation of a health hazard. Such social cost estimates, which can serve as the basis for an effluent charge-based regulation scheme are relatively easy to calculate because they focus on damages to a semi-closed system, Lake Superior. On the other hand, the appropriate fee to be charged a producer of hazardous waste is difficult to conceptualize and even more difficult to calculate.

Despite the problems with evaluating environmental costs, a "pollution" fee compensating for environmental damage has value in promoting the general social welfare in several ways. First, by forcing the firm generating environmental damage to incorporate the cost of the fee in the price of the finished product, the economic incentive promotes the efficient use of resources. Otherwise, society may demand a lower-priced good that does not account for environmental costs. A disproportionate demand might result in additional production of the socially wasteful good. By

82. The literature concerning social valuation and methods for approximating the value of a shared good is extensive. For an estimation technique using survey data and current references, see Jackson, Measuring the Demand for Environmental Quality with Survey Data, 45 J. Pol. 335 (1983).

equalizing prices, however, the fee allows society to freely choose between the product of a firm generating environmental damage, and a competing product of a firm that has expended money to avoid environmental damage. The economic incentive of the tax or fee will also promote surface mining on land that not only has the lower direct operating cost but has the fewer associated externalities. Mining activity will move toward the more damaging sites only as resources become more scarce. Second, the producer of the environmental damage can incorporate the social valuation of environmental goods into his analysis of the costs and benefits of a particular mining site. The additional cost, the "pollution" tax or fee, that the producer must pay reflects the value of the disrupted environment. Third, the revenue generated by the pollution fee or tax is available for reclamation or restoration activity for environmental resources previously damaged.

While analysts have proposed a variety of economic incentives, reclamation bonds have not been examined either theoretically or as provided for in SMCRA. Reclamation bonds are most similar to "refundable deposits" that have been proposed, but not empirically examined, by several economists. As with all economic incentives, refundable deposits should be set at the amount of social costs resulting from the failure of the producer of the damage to correct the damage. Refundable deposits, however, are particularly useful when it is difficult to assess or to directly observe environmental damage because of the type of destruction or the timing of the damage. Refundable deposits could be established, for example, as a disincentive for abandoning vehicles or dilapidated buildings or the accidental spillage of chemicals or oil in transit. In each instance, a person interested in undertaking the regulated activity is required to make a deposit, in an amount sufficient to encourage cooperation, to the regulatory body before engaging in that activity. Upon presenting evidence that the activity has been completed in accordance with the previously announced or agreed upon conditions, the depositor receives a refund.

While most other forms of economic incentives charge the producer an amount equal to the value of the social costs of the environmental destruction, refundable deposits require that producer to make a deposit sufficient to motivate compliance with the appropriate regulations. Thus, with use of a refundable deposit, there is an implicit assumption that the producer of the externality can and wants to prevent the environmental damage and expects to take the steps necessary to receive the refund. The effectiveness of refundable deposits, moreover, does not require, as

84. See ANDERSON, supra note 7.
85. BAUMOL & OATES, supra note 7.
86. See ANDERSON, supra note 7 and the references cited therein.
other economic incentives require, an accurate calculation of the social costs of externalities.

In practice, however, the refundable deposit should equal the cleanup costs resulting from the producer’s failure to correct the environmental damage. Without requiring bonds to approximate true reclamation costs,87 coal operators can make siting decisions that are environmentally and, therefore, socially inefficient. Moreover, social valuation is important in determining the extent of the cleanup required. For example, not all environmental destruction should be cleaned up by a state agency if the depositor fails to do so; in some cases the cost of restoring the environment might exceed the social benefit of such action. In most cases, however, once the producer’s liability for restoring the environment to its near-original position is statutorily established, as it is in SMCRA, the deposit must be set only at a level to motivate compliance and need not be based on social valuation of the derived benefit.

To serve as an economic incentive for environmentally sound coal operations, provisions concerning refundable deposits should contain three requirements. First, because the deposit required should be equal to the cleanup costs, the difficulty with which the selected mining site can be restored is the primary factor in establishing the amount of the required deposit. The larger bond required for mining steep slopes and other difficult areas encourages coal producers to mine easily accessible sites before mining the more difficult and destructive sites. Second, the regulatory agency administering the refundable deposit or reclamation bonding program should consider the probability that an individual coal operator will satisfactorily reclaim the mined land. In setting bond amounts, the regulatory agency, in its administrative discretion, should reward or punish coal operators for their reclamation record. The regulatory agency can use a more conservative estimate of reclamation costs for coal operators with extensive coal mining experience with a solid reclamation record, and who can be expected to comply with current reclamation standards. The regulatory agency can use a higher estimate of reclamation costs for new operators or ones without a history of reclamation compliance. Although SMCRA may not require a complete history concerning an applicant’s prior bonds, SMCRA requires some information on the

87. Although this present analysis focuses only on mining reclamation, it must be noted that there is an interrelationship between reclamation and other environmental problems, specifically the reduction of sulfur emissions from coal generating plants. In the Appalachian region, lower sulfur coal tends to be found on steeper slopes. See Schlottman & Spore, Economic Impacts of Surface Mine Reclamation, 52 LAND ECON. 265, 274 (1976). Since reclamation costs increase with the slope of the land being mined and reclaimed, operators will tend to mine the lower sloped coal reserves, those also having a high sulfur content, before moving to the steeper, yet lower sulfur coal. While it is necessary to narrow the focus of any analysis of an environmental policy, this practical irony does emphasize the danger of over-simplifying the definition of a particular environmental problem.
permit application concerning the operator's past compliance record. Permit applicants must report all notices of violation of SMCRA or any law pertaining to air or water environmental protection during the prior three-year period. Of course, specific bond information could be required on any permit application.

Third, through use of refundable deposits, coal operators who successfully reclaim the land should only have to incur the cost of the bondsman's fees and the interest lost on the fees. In turn, the bondsman's fees should reflect the low risk status of a coal producer with a history of compliance. Coal operators generally finance their operations through issuing stock, allocating retained earnings, or, more likely, by borrowing capital. Reclamation bonds are a normal operating expense and are financed the same way as are equipment purchases or land acquisition. Self-bonding restricts the use of capital for alternative uses and, at a minimum, costs the amount of interest foregone. Bonds arranged through a third-party bondsman involve an additional carrying cost that exceeds the going interest rate because of the risk of forfeiture borne by the bonding agent. In either case, the lower the amount of the bond required, the lower is the financing cost of the required bond. Additionally, a coal operator with an excellent reclamation record is more likely to satisfy the regulatory agency. Therefore, the reduced risk of noncompliance will be reflected in low bonding costs.

While SMCRA requires bonds in order to assure the completion of reclamation activity, at which time the bonds are refunded, the bonding requirement could be extended to protect against later developing environmental damages from acid runoff or subsidence. Instead of refunding all of the bond posted at the time a permit is granted, the regulatory agency could give a partial refund and then refund the remainder a specific number of years in the future. As discussed above, OSM regulations do allow for the segregation of those portions of the permit area where extended liability is necessary. Withholding complete refund encourages operators to undertake these activities which minimize future additional work and reduce the likelihood of future environmental damage and, thus, to avoid bond forfeiture. This long-term bonding is analogous to the economic incentive principle of internalizing externalities because the time limit of the bonding period extends the coal operator liability for environmental damage related to coal surface mining.

Because of the difficulty in monitoring environmental damage associated with surface mining operations, refundable deposits, of which reclamation bonds are an example, are a promising policy tool for the efficient and effective prevention of environmental destruction often re-

sulting from surface mining. Because of the difficulty in estimating the value of surface mining damage or the benefit of reclaiming mined lands due to the massive and longterm benefit of such actions, refundable deposits are more easily administered than alternative incentive-based tools.

EVALUATION OF RECLAMATION BONDS

The key to a successful economic-based incentive program is setting the fee or tax appropriately. A sufficient bond amount promotes efficient use of natural resources. To mold environmental conscientious behavior, the amount of the fee, deposit, tax, or bond must vary according to the mine location, the mining technique employed, and the difficulty of reclamation, because these factors influence the cost of reclamation. In the case of surface coal mining, the reclamation bond amount must be sufficient to cover actual reclamation costs in the event that the work has to be done by a state or federal agency. Additionally, the properly designed program must be implemented in a stringent, yet flexible, fashion. The regulatory agency must strictly set bond amounts, yet use discretion to set varying amounts on the basis of the conditions surrounding each permit, such as the location and type of mining, and the prior reclamation record of the applicant.89

As alluded to above, several states have chosen to fulfill the SMCRA requirements by designing alternative bonding programs. These alternative programs can receive the required OSM approval only if they meet certain criteria as set forth in OSM regulations as follows:

OSM may approve, as part of a state or federal program, an alternative bonding system, if it will achieve the following objectives and purposes of the bonding program:

(1) The alternative must assure that the regulatory authority will have available sufficient money to complete the reclamation plan for any areas which may be in default at any time, and

(2) The alternative must provide a substantial economic incentive for the permittee to comply with all reclamation provisions. (emphasis added) 91

These alternative bonding programs will be described briefly and then

89. Most coal mining states had bonding requirements prior to the enactment of the federal law, but bond amounts were seriously inadequate and forfeitures were seldom pursued. See, e.g., Grandis, The Federal Strip Mining Act: Environmental Protection Comes to the Coalfields of Virginia, 13 U. RICH. L. REV. 455, 467 (1979). See also Congressional Information Service, supra note 13. SMCRA's provisions are more stringent and states have, as a result, made major modifications to their own laws.

90. See supra notes 44-47 and accompanying text.

91. 30 C.F.R. § 800.11(e) (1984).
The most common alternative sets a fixed per-acre bond amount to be paid by the individual permit holder and establishes a special reclamation fund, supported by a cents-per-ton tax on all coal production in the state as a backup source of reclamation funds. Thus, in the event of an operator’s failure to complete all necessary reclamation work on the site, the bond would be forfeited and the proceeds used by the state to complete the work. Any costs of reclamation beyond those covered by the forfeited bond would be paid from the state fund. Under such a plan, individual operators are not held responsible for the entire cost of mine site clean up; rather, the coal industry in the state is subsidizing the failure of irresponsible operators. The coal industry would most likely prefer such a plan over a bonding system based on actual reclamation cost because companies would not have to tie up large sums of capital for a prolonged period of time in a reclamation performance bond. In Virginia, for example, where companies have an option to participate or not in the state reclamation fund, only a few operators have chosen instead to post their own “actual cost of reclamation” bonds.

In theory, the fixed rate bond/reclamation fund system should, at least, guarantee sufficient funds for the state to complete necessary reclamation work upon operator default. There are, however, several problems with the use of the fixed rate bond /reclamation fund system. First, while any fixed per-case bond amount may prove insufficient for some reclamation work, the fixed rates set in these alternative bonding systems are, in most cases, insufficient per se. They range from $500 per acre in Missouri, to $1000 in West Virginia, $2500 in Ohio and Virginia, and $3000 in Pennsylvania. The average per-acre reclamation cost is significantly higher than these flat rates. For example, Arkansas had a $1000 per-acre flat rate during the interim period. OSM’s 1983 Annual Report on the Arkansas Permanent Program reported that a bid received to reclaim a

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92. As indicated supra, note 44, in September 1983, six states had established alternative systems. The systems are discussed here generically because they are essentially similar to one another. The statutory references are set out supra, note 47.

93. Pennsylvania’s Special Reclamation Fund is financed through a $50 per acre non-refundable fee, rather than a production tax.


95. See statutes cited supra, note 47. A Report prepared by the Pa. Dept. of Envtl. Resources found that bond money collected for unreclaimed sites was seriously inadequate to cover the state’s reclamation costs. The report estimates that the state received only $730 per unreclaimed acre between 1977 and 1983, whereas actual reclamation costs vary from $4,000 to $10,000 per acre or more. See Pa. Dept. Envl. Resources, supra note 51, at 27. Curiously, the Report dismisses offhand the possible alternative of increasing actual bond amounts to bring them closer in line with actual reclamation costs. Id. at 34, 36.

twenty-three acre site on which bonds were forfeited amounted to $15,726 per acre.\(^9^7\) The Report concludes:

> [b]onding amounts of $1000/acre for initial regulatory permits is (sic) extremely inadequate for reclamation by (the state agency) in the event of a bond forfeiture

and that the submitted bid

indicates that bonding amounts for permanent program permits (averaging approximately $2000 per acre for the simplest box cut operations and $3000 per acre for more complex operations) are also very inadequate to assure total reclamation by the [state agency] in the event of bond forfeiture.\(^9^8\)

In two states where OSM, in its 1983 oversight reports, found “actual cost of reclamation” bonds to be adequate, the bonds ranged between $7,000 and $8,000 (Illinois), and between $6,075 and $17,885 (Montana).\(^9^9\) Thus, in those states which have established fixed rates, the states inevitably will have to resort to special reclamation funds to accomplish the reclamation work necessary when an operator defaults.

Second, the success of the special reclamation funds relies on smooth state administration of these funds, including continued accrual of sufficient fees and legislative appropriation of funds. At least one state already foresees serious inadequacies with its reclamation fund. A Pennsylvania study shows that, despite the goals and intentions of recent changes in the law, at the close of the 1983 fiscal year there was a shortfall of more than $40 million in state funds necessary to reclaim the 5,200 acres of unreclaimed lands, and further estimates the deficit could reach $120 million by 1990.\(^1^0^0\) Because it is clearly SMCRA’s intent that the bonding system assure completion of the reclamation plan, the potential failure of these alternative systems is a very serious threat to achieving the objectives of SMCRA.

Aside from questions of actual adequacy of the fixed rate/reclamation fund combination of a state alternative program, the system violates several fundamental principles of economic-based incentive programs. Because the per-acre bond does not vary according to any criteria, and because the source for the special reclamation fund is merely the amount of coal produced, the alternative regulatory system does not encourage operators to behave in an environmentally or socially responsible manner. Good reclamation work at one mine site will not benefit the operator in

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\(^9^7\) Id.

\(^9^8\) Id.


\(^1^0^0\) See Pa. Dept. Envtl. Resources, supra note 51, at 26, 32.
future mine permitting endeavors; conversely, a poor reclamation record does not increase the bond costs the operator will bear. Likewise, the coal operator will not adequately consider the difficulty of reclamation in selecting a site because the additional reclamation cost can be avoided simply by forfeiting the flat-rate bond. All incentives are, therefore, removed from the bonding procedure.

Indiana has established a potentially more effective alternative than the fixed-rate programs. Indiana's alternative system provides for a $3000 per-acre minimum bond amount, and a $10,000 maximum, with a special reclamation fund as a secondary means of financing state reclamation projects. Although the $10,000 may not always be sufficient, the program's flexibility may encourage responsible coal-operator behavior, depending upon how such regulatory discretion is used. The state does retain the ability to reward or punish operators on the basis of their prior reclamation practices. This discretion is, of course, in addition to the state's ability to set bond amounts at an amount more accurately tied to site-specific estimated reclamation costs.

Incentive problems are not solely the province of the alternative bonding systems. In the alternative bonding systems, however, problems exist both in the theoretical design and the practical implementation of the alternative policies. In contrast, in a bonding system patterned directly on SMCRA, the shortcomings arise primarily in the implementation of the program. OSM's 1983 oversight reports on state permanent programs highlight some of the implementation problems of both alternative bonding systems and of SMCRA-based programs. The most common difficulty is the states' inability, at the permit application review step, to analyze methodically and accurately potential reclamation costs. An instance of this problem occurred in Oklahoma where OSM found that the state generally set bonds using only reclamation-cost estimates submitted by operators. Four out of five permit applications reviewed used $1,000 as the estimated cost of reclamation, and the state set the bonds at this amount despite the fact that the state is currently contracting reclamation cost at $5,000 to $10,000 per acre. OSM also found that Kansas set bonds by relying solely on operator estimates. Although these bonds now average $2,388, almost three times the amount set during the first years after SMCRA was enacted, OSM still questioned the bonds' adequacy

101. IND. CODE 4 13-4.1-6 (1983); 310 IND. ADMIN. CODE 12-3-8 and 12-4-8(c) (1983).
102. 310 IND. ADMIN. CODE 12-3-10 (1983).
103. See supra notes 95-100, and accompanying text.
104. OSM Annual Report, Oklahoma Permanent Program 22 (July 1983).
105. Id.
107. Id.
because of the state’s own estimates of at least $5,000 per acre. 108 Similarly, in Iowa OSM found not only inadequate analysis of bond amounts, but also discrepancies between operator estimates and the bonds actually posted upon permit approval. 109

Because reclamation costs determine the bond amount, reclamation costs must be estimated realistically. The OSM oversight reports show that state agencies generally underestimate reclamation costs. 110 A recent study using a mine simulation approach to estimate reclamation costs for a variety of surface mines provides more realistic estimates at which performance bonds should be posted. 111 Considering the standard mining techniques and mine types in various regions, this study estimated reclamation costs for typical surface mines in thirteen different states. 112 Per acre reclamation cost estimates in the study range from $6,487 in Oklahoma to $7,975 in Ohio. 113 These cost estimates include not only the direct costs of topsoiling, grading and recontouring, and revegetation, but also nondirect costs. 114

The reclamation cost study also indicated that regions varied to a greater degree when reclamation fees were based on a per-ton fee as opposed to a per-acre fee. On a per-acre basis, reclamation costs are relatively uniform ranging from approximately $6,500 to $8,000. 115 On a per-ton basis, the range is much wider, varying from $0.154 per ton in Wyoming to $1.90 per ton in Alabama. 116 Similarly, as a percent of minimum selling price, estimated reclamation costs range from .154 in Wyoming to 10.8 in Alabama. 117 Hence, per-ton fees, like those used in many state programs as discussed above, 118 have differential impact according to region. When designing mining-reclamation programs, states should consider the disparities in per-ton fees. Moreover, because land surface is what is reclamation, per-acre fees are preferable to per-ton fees.

OSM oversight reports have identified additional state problems which

108. Id.
110. See supra notes 95-100 and accompanying text.
112. The study estimated reclamation costs for Alabama, Arizona, Colorado, Illinois, Indiana, Missouri, Montana, New Mexico, Ohio, Oklahoma, Pennsylvania, Washington, and Wyoming. Id. at 76.
113. Id. at 77-79.
114. Id. at 82. The estimates include “opportunity costs and indirect effects of taxes, secondary equipment requirements, and royalties in calculating the effect of land reclamation activities on the minimum acceptable selling price of surface mined coal.”
115. Id. at 79.
116. Id. at 77-79 (Table 3).
117. Id. at 77-80.
118. The Abandoned Mine Reclamation program established by SMCRA also uses a per-ton fee on current mining operations to pay the costs of reclaiming abandoned mine sites. 30 U.S.C. § 1232 (1982).
frustrate the development of an economic-based incentive program. Some states have failed to consider administrative third-party contracting and inflation costs. Other states have failed to increase bonds on areas permitted during the interim period of OSM's implementation of SMCRA. One state failed to identify specifically the bonded areas, rendering the bond uncollectible due to ambiguously stated provisions, while in other states delay has occurred in bond forfeitures due to litigation delay tactics by bond sureties and operators.

MODIFICATION OF RECLAMATION BONDS

Federal and state surface mining regulations need to be modified to incorporate economic incentives that would promote environmental protection. SMCRA provides the statutory authority both for actual-cost reflective bonds and for alternative bonding schemes. The regulatory authorities should reconsider these bonding provisions and use them to strengthen the economic incentives offered coal operators to engage in environmentally sound practices.

The most immediate shortcoming of the state regulatory programs is that bonding amounts, both as specified in the state programs and as implemented by state agencies at the time a permit is granted, are generally inadequate. In addition to regulatory agencies making realistic estimates of reclamation costs, several recommendations are appropriate. First, because operators are asked to make accurate estimates of reclamation costs, i.e., what the operator would charge if the state hired the operator to do reclamation work, then the state should view the operator’s estimate as a simultaneous offer to do similar reclamation work at the same bid. Therefore, the state can restrict the operator to this bid, including wages, equipment, and other overhead expenses, when that same operator does reclamation work for the state. Second, the state administrative procedure should assure that no estimated bond amount is set below the rate that the state is currently contracting reclamation work. While mining sites vary tremendously in difficulty and extent of required reclamation, a good indicator of reclamation costs is the recent six-month average of per-acre reclamation costs for all sites within the state. Third, because a major portion of the reclamation work will be undertaken several years after the permit is issued, the regulatory agency should consider increased costs of reclamation in calculating the bond. In addition to generally used

120. Supra note 96, at 16; OSM Annual Report, Missouri Permanent Program 10 (June 1983).
121. Supra note 104, at 25.
price indices, a three to five year historical average of the reclamation cost trend in the state could provide estimates. As well, the regulatory agency must assess the additional costs to the state agency of doing the reclamation upon forfeiture. If the state contracts with a third party, there are administrative and related market costs; if the state itself completes the work, equipment costs would be higher than those of the original operator.\textsuperscript{123}

To assure adequate bond amounts, the regulatory agency should also reform administrative procedure to increase the opportunity for citizen review of and participation in the bonding process.\textsuperscript{124} SMCRA does not specifically provide for citizen participation in the performance bond portion of the regulatory program except at the point of bond release.\textsuperscript{125} The initial proposed regulations allowed citizens as well as operators to petition for adjustment of the bond amount set by the regulatory authority and provided for an administrative hearing upon such request.\textsuperscript{126} This section has never been promulgated. The current regulations only permit bond adjustment based on a regulatory authority reevaluation or upon petition from the permittee.\textsuperscript{127} A citizen, therefore, can only voice an objection to the bond estimate submitted by a permit applicant under the permit application review provision of the Act.\textsuperscript{128} This opportunity for participation comes before the bond amount is set by the regulatory authority. As a result, citizens have no means of objecting to the final bond set for a specific permit to mine. If a state agency consistently underestimated the reclamation costs that determine the amount of the requested bond, and regulations provided for a regulatory hearing, then public participation could provide more realistic reclamation cost estimates from other coal operator/contractors or knowledgeable appraisers and consultants. If a state routinely set realistic bond amounts, public participation would not take place and the actual administrative procedures would be streamlined. The provision for citizen participation provides incentive for the regulatory agency to set realistic bond amounts so as to

\textsuperscript{123} Cf. Misiolet & Noser, supra note 111, at 68-69 (arguing that there are potential cost savings to operators when basic mining equipment is used for land reclamation operations).

\textsuperscript{124} Citizen participation is considered by many vital to the successful implementation of SMCRA. Perhaps because of the intense citizen interest during the long years of hearings on the federal law, the act allows for avenues of citizen participation in nearly every area including the permit review process, 30 U.S.C. § 1263 (1982), release of performance bonds \textit{id.} § 1269, enforcement, \textit{id.} 1270, and the designation of certain areas as unsuitable for mining, \textit{id} § 1272. For a review of the act's numerous provisions allowing citizen participation, see Galloway & Fitzgerald, \textit{The Surface Mining Control and Reclamation Act of 1977: The Citizen's "Ace in the Hole,"} 8 N. Ky. L. REV. 259 (1981).

\textsuperscript{125} 30 U.S.C. § 1269 (1982).


\textsuperscript{127} 30 C.F.R. § 800.15 (1984).

avoid the administrative cost and delay often associated with citizen participation.

Finally, to assure adequate environmental protection, the regulatory agency should increase the length of time for which a bond is held. A bond should be held for longer than the period of mining and reclamation activity because the threat of environmental damages continues. The risk of acid mine drainage and land subsidence continues after reclamation is completed. These particular problems, however, are exempt from the bonding provisions. SMCRA provides that the bond may not be fully released until all reclamation requirements of the act are met, and until the period of operator responsibility for revegetation (five to ten years) expires. When viewed as a refundable deposit, however, a portion of the reclamation bond should be held for as long as there is a substantial risk of environmental damage, and for a sufficient period of time to assure that the reclamation work has been completed correctly. For many reclamation problems this risk may be longer than the five to ten year period.

Economic incentives are effective and major tools in motivating operator compliance while, at the same time, reducing the amount of regulation and inspection necessary to assure compliance. Retaining a portion of the initial bond posted will allow the regulatory agency to replace continuous regulation with periodic monitoring of the ecological system during and after mining and reclamation are completed. Private citizens, fish and wildlife officials, or other trained environmental specialists can assist in the post-reclamation monitoring and report to the state agency any environmental damage resulting from a mining operation.

Retention of a portion of the bond posted also places the initiative for monitoring the reclaimed land on the coal operator. The operator will need to correct any potential problems before seeking a full refund of the bond at the end of the observation period. This provision will encourage the more transient coal operators to stay in the industry longer in order to receive the refund and to notify the state agency of their present whereabouts and new operations.

129. See generally, F.X. MURRAY, WHERE WE AGREE: REPORT OF THE NATIONAL COAL POLICY PROJECT 18-20, 146-61, 209-12 (1978) (addressing both industry’s and environmentalists’ perspectives of the environmental problems of coal, particularly subsidence and acid mine drainage.) See also, Rogers, Acid Coal Mine Drainage—The Perpetual Treatment Problem, 1 E. MIN. LAWS INST. 6-1 (1980) (arguing that the effects of acid mine drainage are so uniquely long-term that the individual coal operator responsible for the damage should be excused from liability and that public agencies should assume responsibility for all long-term site repair).

130. OSM initially required underground operators to bond subsidence control and other surface protection measures, but suspended this regulation in the face of litigation challenging its legality. OSM’s rationale was that these activities are part of the regulatory program but are not a requirement of the reclamation plan and, therefore, are not subject to bond provisions. 46 Fed. Reg. 59,934-35 (1981) suspending 30 C.F.R. § 801.16(a).

CONCLUSION

Bonding, as a specific type of refundable deposit, has several other applications in environmental regulation in addition to surface mine reclamation. Theoretically, a bonding scheme can be designed for any environmental problem where (1) the producer of the environmental damage has been assigned liability; (2) the intent is to avoid as much environmental damage as possible and to repair any damage that does occur; and (3) the difficulty of placing a social value on the related environmental damage requires restoration cost as the basis for the amount of refundable deposit, or bonds, instead of the theoretically preferable method of willingness to pay as an indicator of society's valuation of an environmental resource.

Economic incentives in general, and refundable deposits like reclamation bonds in particular, offer the potential for a more efficient and realistic system of regulation. Economic incentives, however, are limited by both the complexity of real world environmental situations and by organizational difficulties faced in implementing a specific incentive-based regulation. While economists generally believe that economic incentives are easier to administer than traditional regulations, this analysis of reclamation bonds provided for in SMCRA suggests that state enforcement of alternative bonding schemes is marked by both design and implementation flaws.

A complete understanding of the relative efficiency and effectiveness of environmental regulation policy tools requires an analysis of both the theoretical underpinnings of alternative policy tools and the institutional framework implementing the regulatory scheme. Improving the organizational structure can potentially increase the effectiveness of regulations as much as redesigning the regulations in accordance with economic principles. As expressed by Majone in a comparison of environmental policy tools, the institutional process is as much a factor in the effectiveness of economic incentives as it is in traditional types of regulation:

The policy-maker's ability to nudge the process toward desired outcomes depends on his realistic appreciation of its dynamics and on his sober assessment of the degrees of freedom allowed by the system. The actual outcomes of environmental policies are affected more by the institutional arrangements emerging from the political process than by the technical characteristics of the instruments employed; to use a statistical image, the "within group" effects (the differential results obtained when the same tool operates under different institutional circumstances) dominate the "between group" differences (the result of different tools used under approximately equal conditions). In other words, the significant choice is not among abstractly considered policy instruments but among institutionally determined ways of operating them. Such a choice cannot be made
by fiat: it results from the relative distribution of power, the political constraints, the skill of the policy-maker in exploiting whatever slack remains in the system. This conclusion throws new light on the systemic rationality of policies that would be rejected on the basis of some narrow criterion, such as economic efficiency.¹³²

No revisions to the SMCRA are required in order to utilize economic incentives for environmental protection. The federal and state authorities need only use their existing authority to implement an efficient and effective reclamation program.

¹³２. Majone, Choice Among Policy Instruments for Pollution Control, POLICY ANALYSIS 589, 593 (1976).