

Encouraging Safety Through Insurance-Based Incentives: Financial Responsibility for Hazardous Wastes

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Financial responsibility provisions require firms whose activities involve risks of damages exceeding their net worth to maintain minimum levels of insurance. Incentives created by policy conditions and premium schedules arising under mandatory insurance schemes can significantly strengthen the deterrent effects of liability rules and provide a valuable supplement to regulatory safety standards. These incentives can only arise, however, if two conditions are met. First, insurers must be able to monitor insureds' safety practices at reasonable cost. Second, applicable liability standards must allow insurers to predict liability on the basis of safety practices.

These requirements create a tension between deterrent aims, which favor easy enforcement of insureds' obligations and a tight link between actions and liability, and compensatory aims, which are often served by restrictions on insurers' ability to limit coverage and by attenuated links between actions and liability. The appropriate balance between deterrent and compensatory aims in any given context depends largely on the benefits that can be obtained by supplementing direct safety regulation with insurance-based incentives.

This Note examines the preconditions and potential benefits of deterring accidents through financial responsibility. The Note then applies these general insights to financial responsibility requirements and liability standards pertaining to hazardous waste management, arguing that the potential benefits of insurance-based incentives in this area justify revision of existing financial responsibility and liability standards.

I. THE DETERRENT POTENTIAL OF FINANCIAL RESPONSIBILITY REQUIREMENTS

In recent years, financial responsibility requirements have become increasingly common in federal health and safety statutes.¹ State financial

1. Provisions mandating or expressly authorizing financial responsibility requirements are particularly prevalent in federal statutes that seek to control environmental harms. *See, e.g.*, Surface Mining Control and Reclamation Act of 1977, 30 U.S.C. § 1257(f) (1982) (requiring permit applicants to obtain liability insurance adequate to provide for personal injury and property damage); Federal

responsibility requirements include compulsory workers' compensation and automobile liability insurance, as well as a growing number of environmental coverage requirements.² Existing financial responsibility requirements and liability requirements are better suited to providing private sources of compensation than to deterring unsafe practices through insurance-based incentives. Even legislative histories that mention the potential deterrent effects of financial responsibility³ often ignore the tension between compensating victims—an objective that favors restrictions on insurance contracts and expansive liability standards—and deterring accidents—an objective that requires easier enforcement of insureds' obligations and a tighter link between actions and liability. Consequently, the potential benefits of using financial responsibility to augment direct regulation have not been realized.

Water Pollution Control Act, 33 U.S.C. § 1321 (1982 & Supp. II 1984) (imposing statutory financial responsibility requirements for ships carrying oil or hazardous substances); Deepwater Port Act of 1974, 33 U.S.C. § 1517(l) (1982) (authorizing regulatory financial responsibility requirements for ships and deepwater port operators); Atomic Energy Damages (Price-Anderson) Act, 42 U.S.C. § 2210(a)-(b) (1982) (requiring compliance with Nuclear Regulatory Commission financial responsibility provisions as prerequisite for obtaining permits to operate nuclear reactors); Resource Conservation and Recovery Act of 1976, 42 U.S.C. §§ 6924(a)(6), 6924(t)(1), 6925(e)(3)(B), 6991b(d) (1982 & Supp. II 1984) (requiring Environmental Protection Agency (EPA) to establish financial responsibility requirements for hazardous waste treatment, storage, and disposal sites, and for underground storage tanks); Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9608(a)-(b) (1982) (establishing financial responsibility requirements for ships carrying hazardous substances and authorizing regulatory standards for other facilities that handle these substances); Outer Continental Shelf Lands Act Amendments of 1978, 43 U.S.C. § 1815(a)-(c) (1982) (requiring ships using offshore port facilities to maintain financial responsibility sufficient to meet statutory liability levels).

Financial responsibility may also be required by regulations promulgated under broad mandates to control specified harms. Invoking its broad authority to protect marine ecosystems through restrictions on ocean dumping permits, Marine Resource Protection and Sanctuaries Act, 33 U.S.C. § 1412(a) (1982), EPA has proposed insurance requirements for ocean-going hazardous waste incinerators. Coverage levels have not yet been specified, but EPA has proposed that a minimum level between \$50 million and \$500 million be selected. *See* Ocean Incineration Regulations, 50 Fed. Reg. 8222, 8233-35 (1985) (to be codified at 40 C.F.R. § 234.10) (proposed Feb. 28, 1985).

2. *See, e.g.*, VA. CODE ANN. § 10-281 (Supp. 1986) (mandating state regulations to ensure financial responsibility of parties abandoning hazardous waste sites); 50 Fed. Reg. 28,702, 28,728-33, 28,753-55 (1985) (discussing state financial responsibility requirements for firms in hazardous waste industry); M. WOODRUFF, J. FONSECA & A. SQUILLANTE, *AUTOMOBILE INSURANCE AND NO FAULT LAW* § 3.5 (1974 & Supp. 1983) (summarizing state automobile insurance requirements and related case law); Workmen's Comp. L. Rep. (CCH) ¶¶ 6004-6054 (indexing and summarizing state workers' compensation laws).

3. *See, e.g.*, H.R. REP. NO. 1069, 96th Cong., 2d Sess. 41-43 (1980), *reprinted in* 1980 U.S. CODE CONG. & ADMIN. NEWS 2283, 2324-25 (financial responsibility will improve truckers' safety practices because "premiums [that insurers] assess are in direct relation to the risks they assume"); S. REP. NO. 1217, 93d Cong., 2d Sess. 15 (1974), *reprinted in* 1974 U.S. CODE CONG. & ADMIN. NEWS 7529, 7543 (financial responsibility intended to "induce maximum effort to prevent the discharge of hazardous substances . . . without . . . impair[ing] competition for deepwater port licenses"); *see also* Request for Comments on RCRA Financial Responsibility Options, 50 Fed. Reg. 33,902, 33,907 (1985) ("[S]uch insurance would provide an effective market force mechanism to help regulate and reduce the risk of environmental damage by an insured facility or organization by demanding responsible environmental management as a condition and cost of [f] insurance.").

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A. *The Theory of Controlling Accident Costs Through Financial Responsibility*

Financial responsibility provisions improve safety by preventing insolvency from undermining the deterrent effects of liability rules.⁴ Liability rules, standing alone, induce profit-maximizing firms to invest in accident avoidance only insofar as accident avoidance reduces risks to the firms' own assets.⁵ Thus, an undercapitalized firm engaged in a risky activity can be expected to cut corners on safety expenditures with the expectation that any damages exceeding the firm's net worth will be borne by third parties. The increased private returns obtained by externalizing liability costs will, all else equal, confer a competitive advantage on undercapitalized enterprises.⁶

Eliminating insolvency as a means of externalizing accident costs can decrease accident levels both by increasing the private costs of goods and services produced through processes that create significant accident risks (thereby reducing overall levels of risky activity), and by strengthening incentives to invest in specific loss-avoidance measures.⁷ The first source

4. Two recent contributions to the law and economics literature investigate other methods for preserving the deterrent effect of liability rules in the face of insolvency problems. See Kraakman, *Corporate Liability Strategies and the Costs of Legal Controls*, 93 YALE L.J. 857, 868-76 (1984) (delineating circumstances under which personal liability for managers can correct for corporations' tendency to undercapitalize in relation to potential liability); Sykes, *The Economics of Vicarious Liability*, 93 YALE L.J. 1231, 1244, 1246-47 (1984) (arguing that vicarious liability may correct for the undercapitalization of employees acting as agents of employer). Both managerial liability and vicarious liability correct for the adverse incentive effects of undercapitalization only if managers or vicariously liable principals hold sufficient assets and assess risks competently. Financial responsibility requirements avoid these potential failings by specifying minimum asset levels and by requiring risk assessments by insurers, whose survival in competitive markets for risk bearing depends upon accurate assessments of risk.

The imposition of liability on stockholders of undercapitalized corporations, a policy of "piercing the corporate veil" in instances of undercapitalization, could also promote accident deterrence. Present standards for piercing the corporate veil, however, generally do not penalize undercapitalization. See Kraakman, *supra*, at 869 n.32 ("[O]nly the California courts . . . have gone so far as to suggest that undercapitalization relative to risk may itself be a ground for disregarding the corporate fiction and holding shareholders liable for tort debts."); see also Note, *Liability of Parent Corporations for Hazardous Waste Cleanup and Damages*, 99 HARV. L. REV. 986 (1986) (arguing that federal courts should pierce corporate veil of parent corporations when subsidiary corporations held liable under CERCLA lack assets to cover damages). Moreover, shareholder liability, like liability for managers or principals, corrects for undercapitalization only if the parties onto whom liability is shifted hold sufficient assets and assess risks competently.

5. A firm that would be forced into bankruptcy by a \$100,000 liability judgment has no economic incentive to expend resources to reduce the expected liability associated with a potential accident from \$500,000 to \$125,000. Moreover, a \$25,000 investment in nonredeployable accident prevention measures would reduce available assets to \$75,000, further distorting loss avoidance incentives. See Landes & Posner, *Tort Law as a Regulatory Regime for Catastrophic Personal Injuries*, 13 J. LEGAL STUD. 417, 419-22 (1984) (presenting simplified model of profit-maximizing investments in prevention of low-probability, high-cost accidents).

6. See Kraakman, *supra* note 4, at 869-70; Stone, *The Place of Enterprise Liability in the Control of Corporate Conduct*, 90 YALE L.J. 1, 71 & n.269 (1980) (noting incentive for large firms to limit liability by contracting out risky projects to undercapitalized spin-offs).

7. See G. CALABRESI, *THE COSTS OF ACCIDENTS* 73-74 (1971) (identifying these mechanisms of

of accident reduction requires only that prices, on average, reflect accident costs.⁸ For example, a mandatory automobile insurance plan that charged all drivers a uniform rate would reduce the number of accidents caused by judgment-proof drivers simply by raising the cost of driving, despite the absence of incentives on drivers to avoid being classified as high risk insureds.

Incentives for specific improvements in operating practices, on the other hand, depend critically on the efforts of insurers—or other financial guarantors⁹—to “regulate” risky activities. Incentives to invest in safety measures can reduce accident costs to a greater extent and at far lower social cost than can general reductions in activity levels. The mechanisms through which insurance requirements encourage safety improvements include risk assessments that precede the issuance or renewal of policies, premium schedules that categorize insureds based on differences in expected losses, and contract provisions that require adherence to specified safety practices.¹⁰

Analyses of insurance and accident deterrence often assert that insurance weakens safety incentives by transferring risk from insureds to insurers.¹¹ Unqualified assertions that insurance weakens deterrence,¹² however, ignore evidence that insurers can contribute significantly to effective

accident cost reduction as alternate forms of “general deterrence”).

8. The deterrence of accidents through generalized increases in the private costs of risky activities is analyzed at length in Shavell, *Strict Liability Versus Negligence*, 9 J. LEGAL STUD. 1 (1980). Shavell argues that the benefits of reducing aggregate levels of injuring activities will, in many circumstances, justify imposition of a strict liability rather than a negligence standard. *Id.* at 10-16.

9. While insurance is the most common form of financial responsibility coverage, some financial responsibility standards also permit other forms of asset guarantees. Federal coverage standards for firms that treat, store, and dispose of hazardous wastes, for example, permit firms to demonstrate financial responsibility by obtaining insurance, a corporate guarantee, a surety bond, or a letter of credit, or by qualifying as a “self-insurer.” 42 U.S.C. § 6924(t)(1) (Supp. II 1984). Any of these forms of coverage implicitly or explicitly prices accident risks. However, insurance and surety approaches, which assign prices to risks in competitive markets, may produce more accurate assessments than financial tests, which depend ultimately on shareholders’ concerns about risks to corporate assets as a check on management safety decisions. Insurance companies’ shareholders and managers are far more likely to pay careful attention to risk portfolios than are shareholders and managers of most manufacturing enterprises.

10. See C. HEIMER, *REACTIVE RISK AND RATIONAL ACTION: MANAGING MORAL HAZARD IN INSURANCE CONTRACTS* 42-44 (1985); see also G. CALABRESI, *supra* note 7, at 60-62 (describing risk differentiation by insurers).

11. See C. HEIMER, *supra* note 10, at 35-36.

12. See, e.g., Pierce, *Encouraging Safety: The Limits of Tort Law and Government Regulation*, 33 VAND. L. REV. 1281, 1298 (1980) (tort damages “reexternalized through liability insurance . . . [because] insurance costs reflect only crudely, if at all, variations in risks of accidents among firms and activities”). But see Rosenberg, *The Causal Connection in Mass Exposure Cases: A “Public Law” Vision of the Tort System*, 97 HARV. L. REV. 849, 861 n.51 (1984) (arguing that experience rating by insurers provides safety incentives).

The perception that insurance attenuates the deterrent effect of liability rules was, from 1971 through 1982, reflected in provisions of New York insurance law that prohibited coverage for damages caused by gradual pollution. N.Y. INS. LAW §§ 46(13)-(14) (McKinnney 1966 & Supp. 1982), repealed by 1982 N.Y. Laws 2060.

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risk management. For example, insurers sponsored research and inspection programs that dramatically improved elevator and steam boiler safety in the 1930's and 1940's.¹³ Insurers' advantages over individual insureds in collecting and analyzing risk data, and in researching and developing safety standards, often outweighed any attenuation of safety incentives that resulted from the pooling of risks.¹⁴ More recent illustrations of the beneficial effects of insurers' expertise in risk management include the extensive risk assessment procedures underwriters employ to screen applicants for pollution liability coverage.¹⁵

Insurers' marked advantages in analyzing and managing risks have improved decisions about accident avoidance even in circumstances in which insurance insulates insureds' own assets from liability judgments. The potential for improving deterrence is still stronger in the case of coverage that insureds obtain to satisfy financial responsibility requirements designed to prevent undercapitalization.

B. *Financial Responsibility and Direct Regulation*

The advisability of efforts to deter accidents through appropriately structured financial responsibility requirements depends, in any given context, on the benefits of augmenting regulatory controls with market incentives. A general approach to this assessment must confront two distinct issues: (1) What conditions must exist for effective insurance-based incentives to arise? and (2) Under what circumstances will insurance-based incentives, once established, promote deterrence effectively?

13. See James, *Accident Liability Reconsidered: The Impact of Liability Insurance*, 57 YALE L.J. 549, 560-61 & n.33 (1948). Professor James also found that insurers prompted marked safety improvements in industrial machinery and aircraft. *Id.* at 561; see also C. HEIMER, *supra* note 10, at 61-66 (describing reductions in fire losses achieved by Factory Mutual insurance groups).

14. James, *supra* note 13, at 563 (insurance credited with effecting "net gain in accident prevention").

Respiratory disease among asbestos workers illustrates the social costs of insulating decisions about risk from the kind of systematic information and expertise possessed by insurers. A recent account of cases brought by asbestos installers against asbestos manufacturers indicates that by 1918—more than fifty years before the first successful suit by an asbestos worker against a manufacturer—American and Canadian life insurance companies had already begun to deny coverage to asbestos workers. P. BRODEUR, *OUTRAGEOUS MISCONDUCT* 13-14 (1985). By 1928, other life insurers had identified asbestos workers as particularly high mortality risks and adjusted premium schedules accordingly. *Id.* at 200. Tragically, however, neither workers' compensation premiums, which reflected state law exclusions for long-latent and partially disabling diseases, nor manufacturers' general liability premiums, which reflected the severe limits that traditional rules of causation and privity imposed on workers' prospects of establishing manufacturer liability, brought this information to bear on pricing and safety practices within the industry.

15. See, e.g., Smith, *Environmental Damage Liability Insurance—A Primer*, 39 BUS. LAW. 333, 341 (1983) (describing risk assessments required of applicants for environmental damage liability insurance); *Pollution Underwriters Must Be Cautious Lot*, NAT'L UNDERWRITER, PROP. CASUALTY EDITION, December 28, 1984, at 44 (John Metelski, Vice President of Stewart Smith Mid-America, stated that "although the hard reality is profit, the eventual result of a coverage such as [environmental impairment liability] will be a cleaner environment").

1. *The Prerequisites of Effective Insurance-Based Incentives*

Insurance contracts establish principal-agent relationships¹⁶ between insurers and policy holders. The principal (the insurer) shares in the risk of undesirable outcomes that only the agent (the policy holder) can influence directly. Parties to insurance contracts, like parties to other principal-agent relationships, seek to reduce "moral hazard" (i.e., to maintain incentives for agents to strive for beneficial outcomes)¹⁷ without sacrificing the advantages of shifting some risks to the principals.

According to economic analyses of the principal-agent relationship, the effectiveness of incentives for appropriate behavior by agents depends on the costs of monitoring behavior and on the correlation between agents' behavior and outcomes.¹⁸ Thus, sophisticated insurance-based incentives will arise only where insurers easily can monitor loss prevention and where loss prevention measures strongly influence expected liability.

Monitoring costs comprise both the costs of observing insureds' behavior and the costs of devising and administering policy conditions that promote efficient loss prevention.¹⁹ Monitoring effectiveness can be reduced, therefore, by restrictions on insurance contracts that preclude certain monitoring and enforcement options.²⁰ Restrictions on insurers' use of incentive mechanisms, such as deductibles, coinsurance requirements, and coverage ceilings, may advance compensatory aims by ensuring that financial guarantors will be responsible to victims for full costs. At the same time,

16. Here, the phrase "principal-agent relationship" refers to the broad range of economic arrangements in which the actions of one party, subject to more or less effective controls by the other, affect outcomes important to both. This functional definition, commonly employed in the economics literature, encompasses a broader range of arrangements than does the legal concept of agency, which applies to legal rights and responsibilities created by agreements through which principals delegate legal authority to agents to act on their behalf. See RESTATEMENT (SECOND) OF AGENCY § 1 (1958).

17. "Moral hazard" refers broadly to aspects of insureds' behavior that increase losses. C. HEIMER, *supra* note 10, at 29-30. Moral hazard has two components: unobserved risk factors that predate insurance coverage (e.g., a propensity to commit fraud), and reductions in care that occur as economically rational responses to risk spreading. *Id.* Insurers often frame the moral hazard problem primarily in terms of the need to screen for preexisting risk factors. In practice, however, insurers also devote considerable attention to the control of ex post incentive effects through mechanisms such as discriminating premium schedules and coverage restrictions designed to encourage loss avoidance. *Id.* at 37-48.

18. See Sykes, *supra* note 4, at 1236-38 (distinguishing among unobservable, imperfectly observable, and cheaply observable behavior and discussing significance of these differences to principal-agent relationship); see also Shavell, *Risk Sharing and Incentives in the Principal and Agent Relationship*, 10 BELL J. ECON. 55 (1979) (presenting formal model of effects of monitoring costs on principal-agent agreements).

19. The technical features of insured enterprises—such as the extent to which risks depend on variation in operating procedures, which tends to be difficult to monitor, as opposed to facility design, which is typically easier to observe—will influence the effectiveness of insurance-based incentives.

20. The financial responsibility provisions of the Comprehensive Environmental Response, Compensation, and Liability Act, for example, substantially limit the types of loss prevention incentives that insurers can write into contracts covering liability for hazardous waste releases. 42 U.S.C. § 9608(c) (1982); see *infra* notes 71-72 and accompanying text.

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however, such restrictions can diminish the deterrent effects of financial responsibility by increasing the administrative costs of incentive mechanisms that insurers use to encourage loss prevention.²¹

The effectiveness of insurance-based safety incentives will also depend on the sophistication of the risk classifications that insurers use to categorize insureds. If risks are precisely categorized, firms seeking insurance will encounter appropriate incentives to invest in efficient loss prevention measures. Precise risk categorization requires a predictable relationship between safety practices and liability. This connection is attenuated by liability rules that hold solvent, accessible parties liable for harms caused by insolvent or inaccessible ones. If differences in loss-prevention measures have little bearing on expected liability, insurers will find it unprofitable to discriminate among insureds on the basis of safety practices.²²

Decisions about the expansiveness of liability standards, like choices about limits on insurers' abilities to enforce policy conditions, therefore, involve tradeoffs between the compensatory and deterrent aims of financial responsibility provisions. Expansion of the scope of liability increases the likelihood of attaching liability to some solvent party but decreases the chances that insurers will discern an actuarially significant relationship between safety practices and expected claims.

2. *Assessing the Role of Insurance-Based Incentives*

Assessments of the benefits of supplementing direct regulation with market deterrence require comparisons of the effectiveness of liability rules and regulation, and of the competence of regulators and insurers in various settings.²³ The appropriate mix of the two approaches²⁴ depends

21. Check, *Risk-Spreaders or Risk-Eliminators? An Insurer's Perspective on the Liability and Financial Responsibility Provisions of RCRA and CERCLA*, 2 VA. J. NAT. RESOURCES L. 149, 171-73 (1982) (decrying restrictions on risk allocation in insurance contracts).

Some restrictions on insurers' defenses are needed to prevent insureds from circumventing financial responsibility requirements by obtaining inexpensive, strictly conditioned policies without any expectation of complying with policy conditions. Otherwise, when liability arose, the insurer would assert its policy defenses, leaving injured parties to assert their claims against judgment-proof insureds. To advance both deterrent and compensatory goals, therefore, financial responsibility requirements should permit insurers to enforce deductible provisions and coverage limitations only insofar as these mechanisms place insureds' own assets at risk.

22. In many circumstances strict liability will produce a more regular relationship between actions and consequences than will a negligence standard because of the uncertainties associated with the judicial determinations of due care that a negligence standard requires. See Calabresi & Hirschhoff, *Toward a Test for Strict Liability in Torts*, 81 YALE L.J. 1055, 1075-76 (1972) (describing sources of uncertainty in judicial administration of negligence standard).

23. The availability of alternative forms of compensation for victims will also be relevant. The distributional consequences of tightening liability rules to establish a predictable link between actions and consequences will be far more acceptable if alternative sources of compensation such as first-party insurance coverage, social insurance, or administrative compensation funds exist (or can be put into place) than if damages from liable parties represent victims' sole recourse.

24. Exclusive reliance on regulation may be warranted where excessive monitoring costs and diffi-

upon the nature of the harm to be controlled, the latency period between risky behavior and resultant harm, and the level of detail and rate of change required in control standards.²⁵

Many harms cannot be compensated by liability actions because victims' losses are smaller than the costs of establishing legal liability or because weak causal connections between injurers and harms frustrate efforts to identify injurers.²⁶ In such cases, liability rules will not internalize the full social costs of risky practices. Regulation will, therefore, be required to control accident costs.

Inaccurate assessments of long-term risks can also lead to inefficient levels of investment in safety incentives.²⁷ Insurance-based incentives offer a distinct advantage over regulation in overcoming this obstacle. To operate profitably, insurers must maintain strong incentives for underwriters to assess risks accurately.²⁸ Regulatory standards are less likely to reflect

culties in establishing liability preclude the development of useful risk categories, or where there is widespread agreement about acceptable practices affecting uniform, well understood risks. See Calabresi & Hirschhoff, *supra* note 22, at 1076 ("Where a collective determination that an action is not worthwhile can be made with a modicum of assurance, prohibitions enforced criminally or through uninsurable fines seem appropriate."). Conversely, exclusive reliance on insurance-based incentives to control risks appears most attractive where monitoring and causation problems are tractable and where regulatory controls fail to keep pace with rapidly changing or widely varying risks. Even where the efficiency attributes of market incentives are most attractive, however, some measure of "inefficient" regulation may be desirable as a means of allowing public participation in important decisions about social risks. See generally Comment, *Due Process Rights of Participation in Administrative Rulemaking*, 63 CALIF. L. REV. 886, 887-98 (1975) (discussing practical and symbolic benefits of public participation in agency rulemaking).

25. Professor Shavell has investigated a different aspect of the choice between regulation and liability rules. Shavell develops a mathematical model demonstrating the advantages of combining regulation and liability incentives where (1) regulators lack complete information concerning risks, and (2) liability rules are weakened by asset insufficiency and the possibility that injured parties will fail to bring suit. Shavell, *A Model of the Optimal Use of Liability and Safety Regulation*, 15 RAND J. ECON. 271 (1984). This Note suggests that financial responsibility requirements can, by correcting the asset insufficiency problem, enhance the effectiveness of liability incentives without incurring the severe informational problems associated with direct regulation.

26. Analyses of tort suits brought by asbestos workers, soldiers exposed to Agent Orange, and daughters of women who took DES during pregnancy have questioned the usefulness of existing tort remedies in mass exposure cases because of the administrative costs associated with litigation involving such widespread injuries and complex issues of causation. See, e.g., Epstein, *The Legal and Insurance Dynamics of Mass Tort Litigation*, 13 J. LEGAL STUD. 475, 491-95 (1984); Landes & Posner, *supra* note 5 (suggesting that effects of causal uncertainty could be ameliorated by allowing suits for probabilistic damages before injuries become manifest); Rosenberg, *supra* note 12, at 881-87 (proposing tort awards based on proportionate liability and probabilistic assessments of harm in toxic tort cases).

For an illustration of the difficulties that plaintiffs often face in establishing a link between environmental contamination and adverse health effects, see *Reserve Mining Co. v. EPA*, 514 F.2d 492, 506-20 (8th Cir. 1975).

27. Both underestimates and overestimates of future risks impose social costs. Underestimates permit accidents to occur that could have been efficiently avoided; overestimates cause resources to be expended on safety that could be employed more productively elsewhere.

28. Some observers have faulted the insurance industry for responding to high interest rates during the mid-1970's and early 1980's by reducing premiums to increase their supply of investment funds. See, e.g., Solomon, *Finger-Pointing Distinguishes Attempts To Fix Blame for Liability Crisis*, 18 NAT'L J. 378, 379 (1986) (citing industry critics' views of insurer responsibility for business cycle

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accurate assessments of long-latent risks because incentives on regulators often favor the interests of powerful political constituencies, rather than the broad public interest in minimizing the sum of losses and avoidance costs. Time horizons for regulatory policy makers, moreover, often do not extend beyond the next election. Although political alignments may sometimes permit officials to “do well while doing good,” regulators do not operate under the steady pressures for accurate risk assessments that markets impose on insurers.²⁹

Delays and resource demands associated with rulemaking procedures constrain the specificity and adaptability of regulatory standards.³⁰ Opponents of stricter controls may block or delay regulatory change when standards are under consideration within the agency, when agency proposals are evaluated by the Office of Management and Budget,³¹ or when Congress appropriates enforcement funds. After a regulatory initiative clears these hurdles, the promulgating agency may still have to devote extensive resources to litigation concerning its adherence to rulemaking procedures and fidelity to the authorizing statute.

in insurance industry); Wayne, *Insurance Industry Under Fire*, N.Y. Times, June 9, 1986, at D1, col. 3 (discussing effects of investment income on underwriting practices). The influence of investment returns on the premiums that insurers charge to indemnify against accident risks does not, however, argue persuasively against insurance-based incentives. Future costs must be discounted whenever choices are made concerning present and future streams of costs and benefits, regardless of whether insurers or regulators perform the calculations. For a description of the methodology of discounting future income streams, including some of the factors that influence the choice of social discount rates, see E. MISHAN, *ECONOMICS FOR SOCIAL DECISIONS* 112–17, 136–40 (1972).

Insurers derive their discount rates from projections about investment performance—projections that respond, in a rough way, to changes in the growth rate of the economy. There is no obvious reason why discount rates set by insurers in this manner should be considered inferior to rates set by the clash of competing interests in the rulemaking process.

29. Well organized opponents of controls may “capture” the agencies that regulate them and exert direct pressure on the content of regulations. See, e.g., Noll, *The Economics and Politics of Regulation*, 57 VA. L. REV. 1016, 1028–32 (1971). Interest group pressures may also operate more subtly, by influencing the information that the agency chooses to collect and the problems it chooses to investigate. For a review of various capture theories and an investigation of their applicability to four agencies, see P. QUIRK, *INDUSTRY INFLUENCE IN FEDERAL REGULATORY AGENCIES* (1981).

30. Normal agency rulemaking follows the notice and comment procedures specified in section 553 of the Administrative Procedures Act, 5 U.S.C. § 553 (1982). Rulemaking under statutes that call for rulemaking on the record is governed by the more detailed procedures of §§ 556 and 557. 5 U.S.C. §§ 556–557 (1982).

Rulemaking also raises enormous logistical problems associated with organizing the information required to set generally applicable standards. See, e.g., S. BREYER, *REGULATION AND ITS REFORM* 109–112 (1982) (discussing informational problems encountered by automobile safety regulators).

31. OMB reviews proposed regulatory actions under authority of Exec. Order No. 12,291, 3 C.F.R. 127 (1981), which establishes a system of pre-publication review, and Exec. Order No. 12,498, 3 C.F.R. 323 (1986), reprinted in 5 U.S.C. § 601 (Supp. III 1985), which gives OMB authority over agency rulemaking agendas at an earlier stage. OMB review has often caused significant delay in the issuance of regulatory health and safety standards. See, e.g., *Environmental Defense Fund v. Thomas*, 627 F. Supp. 566, 570–71 (D.D.C. 1986) (enjoining OMB from introducing any further delay that could cause EPA to miss statutory deadlines); see also Morrison, *OMB Interference with Agency Rulemaking: The Wrong Way To Write a Regulation*, 99 HARV. L. REV. 1059, 1064–71 (1986) (criticizing delay and weakening of health and safety standards due to OMB review).

The administrative costs to insurers of amending policy conditions or changing premium rates are far lower. In a competitive insurance market, insureds bargain for the best obtainable cost combination of policy conditions, coverage, and premiums. Insurers who assess risks competently will offer attractive packages without incurring undue risks. Less competent risk assessments will lead to lost business or excessive liability. Thus insurance markets not only permit, but require, constant adjustments to changed information.

II. FINANCIAL RESPONSIBILITY FOR HAZARDOUS WASTES

The hazardous waste problem aptly illustrates the enormous social costs of permitting risky activities to be conducted under ineffective regulatory controls and liability incentives.³² The current combination of regulatory standards and liability rules continues to permit handling and disposal practices that impose substantial long-term external costs.³³

This section draws on the general insights developed in Part I to argue that the current policy of relying almost entirely on direct regulation to deter unsafe practices is misguided. Insurance-based incentives—particularly incentives affecting generators of hazardous waste—could significantly improve the control of environmental risks, provided that appropriate reforms were undertaken to establish the prerequisites for effective risk differentiation by insurers.

A. *Existing Controls on Hazardous Wastes*

Two statutes carry the burden of the federal response to releases of hazardous wastes into the environment: the Resource Conservation and Recovery Act of 1976 (RCRA)³⁴ and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).³⁵ RCRA

32. The Office of Technology Assessment recently estimated that 10,000 or more hazardous waste sites are likely to require government cleanup and that these cleanups will require "easily \$100 billion or more" in funds from the federal Superfund program. OFFICE OF TECHNOLOGY ASSESSMENT, SUPERFUND STRATEGY 3, 11-15 (1985).

EPA's published list of priority cleanup projects currently contains 538 sites, the majority of which are abandoned disposal sites. See National Priorities List, 40 C.F.R. pt. 300, app. B (1985). Projections based on cleanup financing patterns to date suggest that parties who owned, operated or contributed to these sites ultimately will provide between 29% and 44% of cleanup costs. See U.S. GEN. ACCOUNTING OFFICE, EPA'S PRELIMINARY ESTIMATES OF FUTURE HAZARDOUS WASTE CLEANUP COSTS ARE UNCERTAIN 8, app. III (1984).

33. See *infra* notes 44-46 and accompanying text.

34. See 42 U.S.C. §§ 6901-6991i (1982 & Supp. II 1984).

35. See 42 U.S.C. §§ 9601-9657 (1982). Additional, more limited controls on hazardous substances are imposed by the Toxic Substances Control Act, 15 U.S.C. §§ 2601-2629 (1982 & Supp. 1984) (testing and regulation of chemical products presenting unreasonable risk); the Federal Water Pollution Control Act, 33 U.S.C. §§ 1311(b)(2)(C)-(D), 1317(a) (1982) (releases of hazardous water pollutants into navigable waters); and the Clean Air Act, 42 U.S.C. § 7412 (1982) (emission of haz-

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requires the Environmental Protection Agency (EPA) to impose record-keeping, containment, and labelling regulations on waste generators and transporters.³⁶ These requirements include a manifest system for tracking hazardous wastes from generator to final disposal site.³⁷ In addition, RCRA mandates more extensive regulation of treatment, storage, and disposal facilities (TSDF's), including the imposition of financial responsibility standards.³⁸

CERCLA is designed primarily to remedy environmental damages caused by past improper disposal practices. CERCLA authorizes the President to respond to releases and threatened releases of hazardous substances by ordering or negotiating private cleanups, or by initiating government sponsored cleanups³⁹ using the "Superfund," a trust fund financed initially through general appropriations and special taxes on petroleum and basic industrial chemicals,⁴⁰ and replenished by recoveries from responsible parties under CERCLA's expansive liability standard.⁴¹ To prevent insolvency on the part of responsible parties from undermining CERCLA liability, the Act imposes financial responsibility require-

ardous air pollutants).

36. See 42 U.S.C. §§ 6922-6923 (1982 & Supp. II 1984); 40 C.F.R. §§ 261.1-33, 262.10-51, 263.10-31 (1985); Revised Small-Scale Generator Standards, 51 Fed. Reg. 10,146, 10,175-76 (1986) (to be codified at 40 C.F.R. §§ 262.20, 263.20).

37. The manifest system is required by §§ 3002(5) and 3004(a)(2) of RCRA, 42 U.S.C. §§ 6922(5), 6924(a)(2) (1982 & Supp. II 1984). Regulations implementing the manifest provisions require generators to prepare detailed shipping documents for all hazardous wastes transported off site; the documents must specify the quantities and characteristics of the wastes and the source, route, and ultimate destination of each shipment. 40 C.F.R. §§ 262.20-23 (1985); Revised Small-Scale Generator Standards, 51 Fed. Reg. 10,146, 10,175 (1986) (to be codified at 40 C.F.R. §§ 262.20(e)). For a more detailed description of the manifest system, see DiBenedetto, *Generator Liability Under the Common Law and Federal and State Statutes*, 39 BUS. LAW. 611, 625-28 (1984).

38. See 42 U.S.C. § 6925 (1982 & Supp. II 1984). RCRA provides for enforcement of these detailed TSDF standards through a permitting system administered by EPA and by states that meet the statutory standards for operating their own hazardous waste programs. 42 U.S.C. § 6926 (1982 & Supp. II 1984). A TSDF may not be operated without a permit. Facilities that were in operation on November 19, 1980, however, may obtain "interim permits," which are governed by more lenient standards than final permits, pending review of their final permit applications. 42 U.S.C. § 6925 (e) (Supp. II 1984).

39. See 42 U.S.C. §§ 9604(a), 9606(a) (1982).

40. See CERCLA §§ 211(a), 222-223, 26 U.S.C. §§ 4611-4612, 4661-4662, 42 U.S.C. § 9632-9633 (1982) (establishing taxes and response trust fund). The Superfund (known formally as the Hazardous Substances Response Trust Fund) should be distinguished from the Post-Closure Liability Trust Fund, also established by CERCLA, which is financed through fees assessed for the disposal of hazardous wastes. CERCLA §§ 231-232, 26 U.S.C. §§ 4681-4682, 42 U.S.C. § 9641 (1982). The Post-Closure Fund assumes all liabilities to third parties for TSDF's that have been closed and maintained for five years in accordance with RCRA standards and that can "demonstrate that there is no substantial likelihood" of releases of hazardous substances. 42 U.S.C. § 9607(k)(1) (1982).

41. See 42 U.S.C. § 9607(a) (1982); *infra* notes 64-70 and accompanying text (discussing liability standard).

ments on cargo ships⁴² and authorizes regulatory financial responsibility standards for generators and transporters.⁴³

Current federal law thus contains the foundations for two distinct mechanisms for encouraging safer hazardous waste management: (1) direct regulatory control under the RCRA reporting and permitting programs, and (2) liability for cleanup costs and natural resource damages. The financial responsibility requirements of RCRA and CERCLA represent a potentially important mechanism for deterring unsafe practices. Existing law and policies squander this potential.

1. *Direct Regulation of Hazardous Waste Facilities*

In the decade since the enactment of RCRA, direct regulation has failed to achieve, or even to approach, adequate control of hazardous waste management. Congressional hearings and General Accounting Office investigations have repeatedly described critical shortcomings in the RCRA regulatory program, including long delays in imposing standards,⁴⁴ the failure of standards, when finally formulated, to promote full internalization of environmental costs,⁴⁵ and inadequate

42. 42 U.S.C. § 9608(a) (1982). Specifically, CERCLA requires owners and operators of "vessels" (excluding nonmotorized barges that do not carry hazardous substances) to carry coverage of at least \$300 per gross ton. For vessels that carry hazardous substances as cargo, a minimum level of at least \$5 million is required.

43. 42 U.S.C. § 9608(b) (1982). This section directs the President to promulgate financial responsibility requirements "for facilities in addition to those under subtitle C of the Solid Waste Disposal Act . . . and other Federal law." It is unclear whether Congress intended for this language to allow CERCLA regulations to supersede other financial responsibility requirements or to limit CERCLA financial responsibility to firms not otherwise covered.

44. One recent congressional report stated: "The Committee is extremely concerned that EPA has not been able to comply with past statutory mandates and timetables, not just for RCRA, but for virtually all its programs." H.R. REP. NO. 198, 98th Cong., 2d Sess. 34 (1984), *reprinted in* 1984 U.S. CODE CONG. & ADMIN. NEWS 5576, 5593; *see also* *Environmental Defense Fund v. Gorsuch*, 12 Env'tl. L. Rep. (Env'tl. L. Inst.) 20,376, 20,376-77 (D.D.C. Feb. 12, 1982) (EPA delay in issuing regulations governing cleanup actions), *modified*, 12 Env'tl. L. Rep. (Env'tl. L. Inst.) 20,401 (D.D.C. Mar. 19, 1982); *Environmental Defense Fund v. Thomas*, 627 F. Supp. 566, 570 (D.D.C. 1986) (unrealized aims of "unsuccessful executive lobbying on Capitol Hill can still be pursued administratively by delaying enactment of regulations beyond the date of a statutory deadline").

Delay has also plagued EPA's application of these performance standards through the permitting process. *See* U.S. GEN. ACCOUNTING OFFICE, INTERIM REPORT ON INSPECTION, ENFORCEMENT, AND PERMITTING ACTIVITIES OF HAZARDOUS WASTE FACILITIES 18-19 (1983) [hereinafter INTERIM REPORT] (permitting process complete for only 24 of 8000 existing facilities; officials expect to finish processing initial permit applications between 1990 and 1993).

45. Technical assessments uniformly acknowledge the impermanence of existing containment methods. *See, e.g.*, OFFICE OF TECHNOLOGY ASSESSMENT, *supra* note 32, at 139 ("even with compliance with RCRA groundwater protection standards, land disposal will still pose serious risks to health and environment" (emphasis omitted)); *EPA's Regulations for Land Disposal of Hazardous Wastes: Hearings Before the Subcomm. on Natural Resources of the House Comm. on Science and Technology*, 97th Cong., 2d Sess. 100-95 (1982) (technical experts detailing inadequacies of RCRA containment and monitoring standards). Even the EPA, in an unusually candid preamble to a proposed rule, has stated that "in most cases, even with the application of best available land disposal technology, [migration of wastes] will occur eventually." Proposed TSDF Standards, 46 Fed. Reg. 11,126, 11,128

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enforcement.⁴⁶ In 1984, Congress responded to these problems by tightening RCRA standards pertaining to land disposal,⁴⁷ imposing deadlines for the enforcement of new restrictions,⁴⁸ and constraining EPA's discretion over enforcement policy.⁴⁹ The 1984 amendments may effect some limited improvements, but the institutional limitations discussed above sharply limit the improvements that can be expected from revisions to EPA's statutory mandate.⁵⁰

(1981) (regulations codified in revised form at 40 C.F.R. pts. 122, 260 & 264) (proposed Feb. 5, 1981).

Impermanent disposal options would not externalize costs if disposal charges reflected the full costs of future corrective measures. Existing RCRA provisions for closure and site maintenance, however, fail to bring these costs to bear on present waste management decisions.

46. See, e.g., INTERIM REPORT, *supra* note 44, at 14-16 (only 45% of facilities reviewed in four-state survey inspected in preceding two years, despite EPA policy requiring biennial inspections); see also *Hazardous Waste Control and Enforcement Act of 1983: Hearings Before the Subcomm. on Commerce, Transportation, and Tourism of the House Comm. on Energy and Commerce*, 98th Cong., 1st Sess. 409-12 (1983) [hereinafter *Control and Enforcement Hearings*] (statement of Anthony Z. Roisman, former Chief of Hazardous Waste Section in Lands and Natural Resources Division of the Department of Justice) (criticizing "virtually non-existent" enforcement of RCRA requirements due to extensive cuts in enforcement budget).

One aspect of the enforcement problem concerns the difficulty of communicating the relevant standards to regulated parties. A 1983 survey found that fewer than one half of small business managers were familiar with federal or state regulations on hazardous waste disposal. See Wall St. J., July 25, 1983, at 13, col. 1. Once mandatory coverage requirements were publicized and enforced—a far simpler task, it would seem, than communicating specific design standards—prices and policy conditions administered by insurers would provide a reliable means of transmitting information concerning steps required to reduce environmental risks.

47. Hazardous and Solid Waste Amendments of 1984, Pub. L. No. 98-616, 98 Stat. 3221 (codified in scattered sections of 42 U.S.C. §§ 6901-6991i (Supp. II 1984)). The 1984 Amendments flatly prohibit certain land disposal practices and require EPA to reassess others under tight deadlines and new, more stringent statutory standards. See, e.g., 42 U.S.C. §§ 6924(c)(1)-(2), 6924(g) (Supp. II 1984) (prohibiting landfill disposal of hazardous wastes in free liquid form effective Apr. 8, 1985, mandating regulations to minimize landfill disposal of containerized hazardous wastes by Feb. 8, 1986, and requiring formal EPA assessment of appropriateness of landfill disposal for each type of hazardous waste).

For a discussion of Congress' reasons for establishing specific statutory standards, despite its acknowledged weaknesses as a standard setter, see Florio, *Congress as Reluctant Regulator: Hazardous Waste Policy in the 1980's*, 3 YALE J. REG. 351 (1986). Congressman Florio declines to attribute the poor performance of EPA's hazardous waste programs to structural problems such as chronic inefficiency or agency capture. He nevertheless identifies another "structural problem" when he states that "[t]he present conflict between Congress and EPA dramatically illustrates how the executive branch, acting through the administrative agencies, can virtually emasculate statutes through strategic inaction." *Id.* at 353.

48. See, e.g., 42 U.S.C. § 6925(e)(2) (Supp. II 1984) (requiring EPA to revoke interim permits for facilities failing to comply with groundwater monitoring and financial responsibility requirements by Nov. 8, 1985).

49. See 42 U.S.C. § 6927(e) (Supp. II 1984) (mandating biennial inspections of hazardous waste facilities).

In March 1985, EPA completed an inspection and enforcement strategy aimed at bringing 90% of TSDF's into compliance with applicable standards by 1989. A recent General Accounting Office assessment of the strategy, however, raises doubts about EPA's prospects for achieving this goal. U.S. GEN. ACCOUNTING OFFICE, ASSESSMENT OF EPA'S HAZARDOUS WASTE ENFORCEMENT STRATEGY (1985).

50. RCRA regulations are subject to the delays and inflexibility endemic to the rulemaking process. See *supra* notes 44-46 and accompanying text. Even optimistic agency and congressional projections concerning future improvements recognize significant limitations on the flexibility and timeliness

In addition, effective regulation will continue to depend upon EPA enforcement budgets,⁵¹ which have been sorely inadequate despite close public attention to hazardous waste issues. Growing pressures on federal and state budgets lengthen the odds against the sustained commitment to credible enforcement that would be required for statutory and regulatory restrictions to exert effective control. Under these circumstances, insurance-based incentives, with their reliance on private rather than public enforcement devices, offer considerable advantages.

2. *Existing Financial Responsibility Requirements*

Both RCRA and CERCLA contain financial responsibility provisions.⁵² These provisions differ significantly in the types of facilities and damages to which they pertain. Given appropriate reforms, financial responsibility under RCRA and, more importantly, under CERCLA, can play important roles in augmenting direct regulation of hazardous wastes.

a. *RCRA Financial Responsibility*

RCRA regulations require owners and operators of TSDF's (but not waste generators or transporters) to demonstrate two forms of financial responsibility. Facility owners and operators must first ensure that adequate funds will be available to meet their own estimates of the costs of closing their facilities and maintaining protections against releases for a

of hazardous waste regulation. *See, e.g.*, INTERIM REPORT, *supra* note 44, at 18 (estimating that 36 to 48 months are required to review individual applications for final landfill permits).

The RCRA program also appears to have been handicapped by unusually erratic management. *See, e.g.*, STAFF OF SUBCOMM. ON OVERSIGHT AND INVESTIGATIONS OF THE HOUSE COMM. ON ENERGY AND COMMERCE, 97TH CONG., 2D SESS., HAZARDOUS WASTE ENFORCEMENT 31-36 (Comm. Print 1982); *see also Control and Enforcement Hearings, supra* note 46, at 409-15 (enforcement problems attributed to lack of commitment by high-level officials).

Some deviation from a policy of full cost internalization may be warranted by legitimate concerns about the effects that increased disposal costs could have on the incidence of illegal, "midnight" dumping. *See infra* notes 78-82 and accompanying text. These concerns justify, at most, measured relaxation of those standards most likely to elicit environmentally harmful responses. They cannot justify lax enforcement or delays in issuing regulatory standards.

51. *See supra* note 46 and accompanying text.

52. *See* RCRA §§ 3004(a)(6), 3004(t), 42 U.S.C. §§ 6924(a)(6), 6924(t) (1982 & Supp. II 1984); CERCLA § 108(b), 9608(b) (1982).

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period of thirty years.⁵³ Facilities must also maintain coverage “for bodily injury and property damage to third parties.”⁵⁴

RCRA financial responsibility fails to provide adequate safety incentives because existing regulations do not require TSDF's to internalize the full costs of releases. Coverage requirements for closure and maintenance undercut potential safety incentives by tying coverage levels to facilities' own estimates of closure and maintenance costs, rather than to independent estimates of the potential costs of meeting closure and maintenance standards. The current approach can produce adequate coverage levels only if agency officials conduct frequent, highly critical reviews of closure plans. In actuality, reviews of TSDF estimates of closure and post-closure costs have been infrequent and cursory at best.⁵⁵

RCRA coverage requirements for liability to third parties do not rely on facility owners' assessments of potential liability. They nevertheless fail to internalize the full costs of TSDF operations because required levels of coverage fall far short of potential third-party damages.⁵⁶ Current regulations also allow facilities to operate with third-party liability coverage that applies only to claims filed during a specified policy period—typically one year.⁵⁷ Unlike traditional “occurrence-based” policies, which cover all losses caused by events transpiring during the coverage period (even if

53. 40 C.F.R. §§ 264.111–120, .142–.145, 265.111–117, .142–.145 (1984); Revision to Closure and Post-Closure Standards, 51 Fed. Reg. 16,422 (1986) (to be codified in scattered sections of 40 C.F.R. pts. 264, 265). The 30-year period of post-closure care can extend well beyond the transfer of liability for third-party damages from owners and operators to the Post-Closure Liability Trust Fund. *See supra* note 40.

The regulations specify several acceptable means of providing assurances for closure and post-closure costs, including a combined financial test and corporate guarantees, insurance, trust funds, surety bonds, and letters of credit. 40 C.F.R. §§ 264.143, .145–.146, 265.143, .145–.146 (1984); Revisions to Closure and Post-Closure Standards, 51 Fed. Reg. 16,422 (1986) (to be codified in scattered subsections of 40 C.F.R. pts. 264, 265).

54. 40 C.F.R. §§ 264.147, 265.147 (1984); Revisions to Liability Coverage Standards, 51 Fed. Reg. 25,350 (1986) (to be codified at 40 C.F.R. §§ 264.147, .151, 265.147). Current regulations require TSDF's to maintain coverage levels of \$1 million per occurrence (\$2 million annually) for “sudden, accidental occurrences” and \$3 million per occurrence (\$6 million annually) for “nonsudden accidental occurrences.” Like the coverage requirements for closure and post-closure costs, third-party liability regulations permit several coverage options. *Id.*

55. *See, e.g.*, INTERIM REPORT, *supra* note 44, at 12–13 (only one of 21 inspectors in four-state survey claimed to conduct thorough evaluations of closure plans; others cited lack of “time, training, detailed criteria, and cost estimation guides” needed to perform adequate review).

Moreover, even if EPA and the states could be assumed to scrutinize closure plans as carefully as would profit-conscious insurers under a system requiring guarantees of adequate closure, the latter approach would still enjoy marked efficiency advantages because insurers can more readily change their standards in response to technological change and improved information. *See supra* notes 30–31 and accompanying text.

56. *See generally* CONGRESSIONAL RESEARCH SERV., 96TH CONG., 2D SESS., SIX CASE STUDIES OF COMPENSATION FOR TOXIC SUBSTANCES POLLUTION: ALABAMA, CALIFORNIA, MICHIGAN, MISSOURI, NEW JERSEY, AND TEXAS (Comm. Print 1980) (describing injuries and compensation actions arising from toxic substances pollution).

57. 40 C.F.R. §§ 264.147, 265.147 (1985). For an explanation of EPA's reasons for permitting claims-made coverage, see 47 Fed. Reg. 16,544, 16,548 (1982).

they do not become manifest until after the coverage has lapsed), these so-called "claims-made" policies allow insurers to avoid any potential liability by canceling coverage at the end of a policy period.⁵⁸ Claims-made coverage neither deters nor assures compensation for long-latent harms.⁵⁹

b. CERCLA Financial Responsibility

Section 108 of CERCLA⁶⁰ imposes financial responsibility requirements on ships that carry hazardous substances and authorizes the imposition of regulatory standards on other facilities, including generators and transporters of hazardous substances⁶¹—enterprises not subject to financial responsibility regulation under RCRA. EPA has not yet issued, or even proposed, CERCLA financial responsibility regulations for facilities not covered by statutory requirements.⁶²

Were EPA to move forward with CERCLA financial responsibility requirements,⁶³ two aspects of the current statute would impede the development of effective insurance-based incentives. First, CERCLA's financial responsibility provisions require coverage against liability for cleanup costs and natural resource damages assessed under an extremely expansive liability standard. Section 107 of the Act⁶⁴ has been interpreted to impose strict⁶⁵ and, more important, joint and

58. See Smith, *supra* note 15, at 341-42.

59. See Abraham, *Cost Internalization, Insurance, and Toxic Tort Compensation Funds*, 2 VA. J. NAT. RESOURCES L. 123, 140 (1982) ("Claims-made coverage deliberately postpones calculation of and responsibility for most of the consequences of present risky behavior.").

60. 42 U.S.C. § 9608 (1982).

61. Compare 42 U.S.C. § 9601(9) (1982) (CERCLA "facilities" include "any site or area where a hazardous substance has . . . come to be located") with 42 U.S.C. §§ 6903(3), (33)-(34), 6924 (1982 & Supp. II 1984) (definitions of facilities subject to RCRA financial responsibility requirements).

62. EPA, in fact, is nearly three years behind the statutory deadline for identifying the facilities for which standards will first be developed. See 42 U.S.C. § 9608(b)(1) (1982). The agency has, however, requested comments to assist it in identifying high-risk facilities. Notice, 48 Fed. Reg. 21,598 (1983).

63. EPA may soon be subject to a statutory deadline for promulgating CERCLA financial responsibility regulations. The Superfund reauthorization bill approved by the House on Dec. 10, 1985, would require EPA to issue these regulations on a tight timetable following the bill's enactment. H.R. 2005, 99th Cong., 1st Sess. [House version, formerly H.R. 2817] § 108(a), 131 CONG. REC. H11,619, H11,625 (daily ed. Dec. 10, 1985). The only financial responsibility provisions in the Senate bill pertain to coverage requirements for ocean incineration vessels. H.R. 2005, 99th Cong., 2d Sess. [Senate version, formerly S. 51] § 108(c) 131 CONG. REC. S12,184, S12,185 (daily ed. Sept. 26, 1985).

64. 42 U.S.C. § 9607 (1982).

65. CERCLA does not specify strict liability. Strict liability is imported by section 101(32), 42 U.S.C. § 9601(32) (1982), which incorporates the liability standard of § 311 of the Federal Water Pollution Control Act, 33 U.S.C. § 1321 (1982). Section 107(b) of CERCLA creates defenses to CERCLA liability for damages resulting from "act[s] of God," "act[s] of war," and unforeseeable acts or omissions of third parties. 42 U.S.C. § 9607(b) (1982). Courts have properly declined to expand these narrow defenses into a fault standard of liability. See, e.g., *Bulk Distribution Centers, Inc. v. Monsanto Co.*, 589 F. Supp. 1437, 1443 n.15 (S.D. Fla. 1984); *United States v. Northeastern Pharmaceutical & Chem. Co.*, 579 F. Supp. 823, 843-44 (W.D. Mo. 1984); see also *United States v. LeBeouf Bros. Towing Co.*, 621 F.2d 787, 789 (5th Cir. 1980) (adopting narrow interpretation of

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several⁶⁶ liability on firms that generate, store, treat, transport, or dispose of hazardous substances.⁶⁷ A strict liability standard probably makes claims more predictable than they would be under a negligence standard.⁶⁸ However, joint and several liability allows parties that contribute only small quantities of hazardous substances to release sites to be held liable for the full amount of cleanup costs and resource damages.⁶⁹ Where net assets, rather than contributions to release problems, represent the primary determinant of liability, insurance markets cannot provide effective loss avoidance incentives.⁷⁰

CERCLA also restricts insurers' ability to condition coverage on adherence to policy provisions. Section 108(c) requires insurers to assume initial liability for all response costs and resource damages, irrespective of any

analogous third-party defense provisions under Clean Water Act), *cert. denied*, 452 U.S. 906 (1981). See generally Comment, *CERCLA Litigation Update: The Emerging Law of Generator Liability*, 14 *Envtl. L. Rep. (Envtl. L. Inst.)* 10,224, 10,228-29 (1984) (summarizing legislative history and judicial interpretations limiting role of fault in CERCLA liability).

66. Language calling for joint and several liability was deleted during the negotiations that secured the enactment of CERCLA in the waning days of the 96th Congress. See Comment, *supra* note 65, at 10,231. Nevertheless, the Act's legislative history has generally been interpreted to authorize joint and several liability to the extent that it would be appropriate under common law standards. See, e.g., *United States v. South Carolina Recycling and Disposal, Inc.*, 14 *Envtl. L. Rep. (Envtl. L. Inst.)* 20,272, 20,275-76 (D.S.C. Feb. 23, 1984); *United States v. Chem-Dyne Corp.*, 572 F. Supp. 802, 808 (S.D. Ohio 1983). But see, e.g., *United States v. A & F Materials Co.*, 578 F. Supp. 1249, 1256-57 (S.D. Ill. 1984) (joint and several liability must be tempered by deference to Congress' intent to avoid harsh and unfair outcomes).

EPA's policy governing settlement negotiations with potentially liable parties utilizes the threat of joint and several liability to increase negotiated recoveries from private parties. See EPA Interim Enforcement Policy, 50 *Fed. Reg.* 5034, 5037 (1985); see also Light, *A Defense Counsel's Perspective on Superfund*, 15 *Envtl. L. Rep. (Envtl. L. Inst.)* 10,203, 10,206 n.20 (1985) (government's complaints in Superfund actions invariably allege joint and several liability).

Section 107(e)(2) of CERCLA preserves any right of contribution that a defendant subject to joint and several liability would have under applicable state law. 42 U.S.C. § 9607(e)(2) (1982); see *South Carolina Recycling & Disposal*, 14 *Envtl. L. Rep. (Envtl. L. Inst.)* at 20,276 n.8; *Chem-Dyne*, 572 F. Supp. at 807 n.3. This provision does not provide a predictable limit on a generator's liability, however, because many states continue to disallow contribution among joint tortfeasors, and because contribution statutes provide no relief if other tortfeasors are unidentified or judgment-proof. See Rogers, *Three Years of Superfund*, 13 *Envtl. L. Rep. (Envtl. L. Inst.)* 10,361, 10,362-63 (1983).

67. Section 107(a)(3) of CERCLA limits generator liability to persons who "arrange" for disposal or treatment at sites where releases or threatened releases subsequently materialize. 42 U.S.C. § 9607(a)(3) (1982). To date, the courts have interpreted "arranging" broadly, so that few generators appear to fall outside the reach of CERCLA liability. See, e.g., *Missouri v. Independent Petrochemical Corp.*, 610 F. Supp. 4 (E.D. Mo. 1985) (allowing recovery action against generator who arranged for disposal at site other than eventual release site); *United States v. Wade*, 577 F. Supp. 1326, 1333 n.3 (E.D. Pa. 1983) (rejecting argument that generator must select site to "arrange for disposal"). See generally Comment, *"Arranging for Disposal" Under CERCLA: When Is a Generator Liable?*, 15 *Envtl. L. Rep. (Envtl. L. Inst.)* 10,160 (1985) (summarizing case law on generator liability).

68. See *supra* note 22 and accompanying text.

69. See Comment, *supra* note 65, at 10,225.

70. See U.S. DEP'T OF THE TREASURY, OFFICE OF DOMESTIC FINANCE, *HAZARDOUS SUBSTANCE LIABILITY INSURANCE* 111 (1982); see also Light, *supra* note 66, at 10,207 (incentives "dissipated by a system which punishes on the basis of financial resources rather than improper conduct"); Schmalz, *Superfunds and Tort Law Reforms—Are They Insurable?*, 38 *BUS. LAW.* 175, 184 (1982) ("chaotic situation" created by imposition of strict liability on numerous firms for same injury).

(nonwillful) violations of contract conditions by insureds.⁷¹ To recover deductibles and losses attributable to violations of policy restrictions, insurers must bring separate actions against insureds.⁷² By increasing the costs of administering loss-control incentives, these restrictions limit the potential deterrent effects of CERCLA financial responsibility.

B. *The Role for Insurance-Based Incentives in Controlling Hazardous Wastes*

Environmental damage caused by the release of hazardous wastes fits the profile developed in Part I of harms that can be deterred effectively by insurance-based incentives. First, the costs of hazardous waste cleanup appear to be large⁷³ in relation both to the costs of establishing liability⁷⁴ and to the costs of classifying and screening risks for insurance purposes.⁷⁵ Second, releases often occur years after the storage or disposal of hazardous wastes. Application of insurers' expertise in assigning current prices to long term risks could therefore confer significant advantages.⁷⁶ Finally,

71. 42 U.S.C. § 9608(c) (1982). The House's Superfund reauthorization bill would redress this problem by requiring that claims be asserted initially against insureds except in cases where bankruptcy or jurisdictional obstacles preclude such actions. H.R. 2005, 99th Cong., 1st Sess. [House version, formerly H.R. 2817] § 108(d), 131 CONG. REC. H11,619, H11,625 (daily ed. Dec. 10, 1985).

72. See Cheek, *supra* note 21, at 172-73.

73. A recent projection of Superfund financing requirements by the Office of Technology Assessment surveyed estimates of site cleanup costs from a number of sources. Figures ranged from \$1 million (1984 estimate for less serious sites advanced by the Association of State and Territorial Solid Waste Management Officials) to \$30 million per site (1984 estimate developed for the Chemical Manufacturers Association by Arthur D. Little, Inc.). See OFFICE OF TECHNOLOGY ASSESSMENT, *supra* note 32, at 36.

74. Because of the difficulty of tracing individual injuries to hazardous waste exposures, the ratio of administrative costs to compensation is likely to be higher in suits for personal injuries linked to hazardous wastes than in suits for cleanup costs and resource damages. See DiBenedetto, *supra* note 37, at 617 ("Even if causation can be established, the cost [of proving causation in personal injury cases] may be prohibitive to many hazardous waste plaintiffs."); see also SUPERFUND SECTION 301(e) STUDY GROUP, INJURIES AND DAMAGES FROM HAZARDOUS WASTES: ANALYSIS AND IMPROVEMENT OF LEGAL REMEDIES 225-29 (1982) (recommending separate administrative recovery system for personal injuries to minimize administrative costs).

75. Even under current rules, which deny insurers the scale economies that would accompany more extensive financial responsibility requirements, insurers have found that the expected savings in payouts justify fairly aggressive monitoring and incentive devices. See Kunzman, *The Insurer as Surrogate Regulator of the Hazardous Waste Industry: Solution or Perversion?*, 20 FORUM 469, 477 (1985) (describing detailed inspection and risk assessment process); Smith, *supra* note 15, at 341 (describing screening for environmental damage coverage); see also MacIntyre, *Insurers Can 'Make Money' on EIL Coverage: Scientist*, BUS. INS., May 28, 1985, at 67, 68 (describing risk reduction program of prominent waste management firm and effects of loss avoidance on availability of insurance).

76. Some previous commentaries on the subject of hazardous wastes and insurance have stressed the difficulties that uncertain risks pose for insurers when they decide about prices and policy conditions. See, e.g., Abraham, *supra* note 59, at 127; Kunzman, *supra* note 75, at 481-82. Negative assessments of the effectiveness of insurance-based incentives on this count are unconvincing, however, without some comparison to alternative, purportedly superior control mechanisms. In ignoring insurers' significant advantages over regulators in coping with the formidable technical uncertainties associated with hazardous waste management, these commentaries overlook a critical aspect of the issue.

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control of hazardous waste management calls for a degree of variegation and adaptability that direct regulation is ill-suited to provide.

1. *Potential Practical Obstacles*

Two potential obstacles to the development of insurance-based incentives warrant attention: illegal dumping and its relationship to the costs of legal disposal, and recent trends in pollution insurance markets. Although neither factor undermines the case for insurance-based incentives, each could influence the content of an appropriate implementation strategy.

a. *Illegal Disposal*

If generators and transporters were certain to deliver all hazardous wastes to permitted facilities regardless of cost, RCRA financial responsibility requirements for TSDF's alone would suffice to internalize the most significant costs of improper hazardous waste management. In the absence of illegal dumping problems, stringent financial responsibility requirements for TSDF's would reduce environmental risks through both mechanisms described in Part I. First, risk categorization by insurers and other financial guarantors would create specific incentives for TSDF's to reduce expected damages. In addition, general increases in the prices of TSDF services would encourage generators and transporters to find substitutes for TSDF services, such as high-temperature incineration, waste recycling, and production techniques that reduce waste output.⁷⁷

Unfortunately, the desire to internalize the costs of hazardous waste management must be tempered by concerns about the effects of increased costs on the incidence of "midnight dumping." Although the exact dimensions of the illegal dumping problem are unknown,⁷⁸ Congress,⁷⁹ EPA,⁸⁰ and the states⁸¹ have all recognized the extreme difficulty of enforcing prohibitions on illegal disposal and the resultant need to moderate cost

77. Even in this world of perfect compliance, however, financial responsibility for generators and transporters under CERCLA might still be warranted as a means of reducing the number and severity of accidental releases that occur before wastes are delivered to TSDF's.

78. See *Post-Closure Liability: Hearings Before the Subcomm. on Commerce, Transportation and Tourism of the House Energy and Commerce Comm.*, 98th Cong., 1st Sess. 116 (1984) (statement of Linda Greer, scientist for the Environmental Defense Fund) (suggesting that New York State's taxation of wastes at disposal sites sharply increased the incidence of illegal dumping); U.S. GEN. ACCOUNTING OFFICE, *ILLEGAL DISPOSAL OF HAZARDOUS WASTES 9-13* (1985) [hereinafter *ILLEGAL DISPOSAL*] (general consensus on importance of illegal disposal problem despite uncertainty concerning precise dimensions).

79. See *Profile of Organized Crime—Great Lakes Region: Hearings Before the Permanent Subcomm. on Investigations of the Senate Comm. on Governmental Affairs*, 98th Cong., 2d Sess. 284-86 (1984) (reporting on survey of enforcement actions against illegal dumpers in 50 states).

80. *ILLEGAL DISPOSAL*, *supra* note 78, at 10-11 (EPA receives three times as many credible reports of illegal dumping as it is able to investigate).

81. *Id.* at 11 (describing state enforcement officials' perceptions of the illegal dumping problem).

internalization in view of the effects of increased disposal costs on the incidence of illegal dumping.⁸²

The importance of keeping wastes within the authorized disposal system, despite that system's plain shortcomings, heightens the need for financial responsibility standards for generators and transporters under CERCLA. As long as the prices charged for treatment, storage, and disposal services fall short of the full social costs of disposal, financial responsibility under CERCLA can create beneficial incentives for generators and transporters to minimize their reliance on socially detrimental disposal options.

b. *The Market for Pollution Insurance*

The use of financial responsibility to encourage appropriate practices by generators and transporters could also be constrained by limits on insurance capacity and by insurers' purported reluctance to undertake aggressive research and risk management programs.⁸³ Although the market for pollution coverage has been characterized by significant growth and innovation over the past fifteen to twenty years,⁸⁴ current conditions lend some credence to these concerns. During the past two years, the market for pollution coverage has contracted sharply, coverage limits have fallen, and insurers have replaced occurrence-based with claims-made coverage.⁸⁵ These trends have been ascribed to unanticipated underwriting losses, uncertainty about the technical determinants of environmental risks, and

82. EPA is no doubt reluctant to cite compliance problems as a formal justification for limiting the stringency of regulatory requirements. The Agency did, however, explicitly rely on this argument in opposing a 1982 proposal to regulate "small generators" (firms producing less than 1000 kilograms of hazardous waste per month). In its 1982 Pollution Control Guide, the EPA stated that "reduction or elimination of the exemption for [small quantity generators] would be more likely to result in mismanagement and 'midnight dumping' rather than proper waste disposal." See DiBenedetto, *supra* note 37, at 627 n.121.

83. See Katz, *RIMS President Accuses Insurers of Abdicating Their Risk-Taking Role*, NAT'L UNDERWRITER, PROP. & CASUALTY EDITION, Oct. 11, 1985, at 1, col. 3; see also Pfennigstorf, *Environment, Damages, and Compensation*, 1979 AM. B. FOUND. RES. J. 347, 446-47 (criticizing perceived passivity of insurers' approach to environmental risks).

84. Two forms of coverage against pollution liability have evolved over the past two decades: occurrence coverage under Comprehensive General Liability (CGL) policies, and claims-based coverage under Environmental Impairment Liability (EIL) policies. CGL coverage for pollution first gained widespread acceptance in the late 1960's. Since then, the numbers of policies written and the stringency of standard coverage restrictions have varied with changes in insurers' assessments of future pollution liabilities. See Pollution Liability Coverage Notice, 50 Fed. Reg. 33,902, 33,903-04 (1985); Hourihan, *Insurance Coverage for Environmental Damage Claims*, 15 FORUM 551, 552-54 (1980). EIL coverage, which, unlike many CGL policies, extends to claims for gradual pollution, became widely available around 1981 due largely to the efforts of the Pollution Liability Insurance Association, a reinsurance pool comprising roughly 40 insurers. See Pollution Liability Coverage Notice, *supra*, at 33,904.

85. Diamond, *Insurance Against Pollution Is Cut*, N.Y. Times, Mar. 11, 1985, at 1, col. 6.

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fears that further changes in legal rules will undermine the basis upon which policies are currently written.⁸⁶

The significance of the recent contraction in pollution insurance markets to the viability of insurance-based incentives can easily be overstated. Increasing prices are a predictable, necessary response to insurers' reappraisals of risk based on loss experience and improved information. Decreases in the amount of coverage purchased follow predictably from these price increases, at least as long as firms creating environmental risks are permitted to operate without liability coverage.⁸⁷

The critical question for the viability of insurance-based incentives is not whether enterprises that impose environmental risks can obtain coverage at prices they find affordable, but whether insurance markets, in setting the premiums for insuring environmental risks, produce tolerably accurate evaluations of the social costs that these enterprises are likely to impose. Insurers' innovative approaches to new and uncertain risks, both in pollution coverage⁸⁸ and in other fields,⁸⁹ suggests that a competition exists in these markets. In the absence of any indication that insurers regularly overestimate risks (a phenomenon that would be unlikely to persist in a competitive market for risks), there is no basis for projecting that hazardous waste facilities subject to stringent financial responsibility requirements would be unable to obtain coverage on terms that assign appropriate prices to the risks that these facilities create.⁹⁰

86. See Pollution Liability Coverage Notice, *supra* note 84, at 33,904-06.

87. One of the principal strengths of a system of market incentives is its capacity to adapt quickly to new information about risks. Without financial responsibility requirements, however, sharp rate increases may provide an incentive for insureds to externalize expected accident costs rather than to minimize risks.

It is important not to exaggerate the magnitude of the recent losses incurred by liability insurers. Total reserves of property and casualty insurers increased every year from 1970 through 1983, reaching \$122.7 billion before the \$3.55 billion loss recorded in 1984 (the last year for which figures are available). See *Insurance Issues and Superfund: Hearing Before the Senate Comm. on Environment and Public Works*, 99th Cong., 1st Sess. 166 (1985) (written submission of T. Lawrence Jones, President, American Insurance Association); see also Hunter, *Taming the Latest Insurance "Crisis"*, N.Y. Times, Apr. 13, 1986, at F3, col. 1 (noting recent increases in prices of insurance stocks as premiums rise).

88. See, e.g., Smechuyzen, *Program Designed to Insure Risks Found in Hazardous Waste Industry*, ROUGH NOTES, July 1983, at 37 (describing development of associations and service groups to ease pollution coverage transactions).

89. See CONGRESSIONAL RESEARCH SERV., 99TH CONG., 1ST SESS., INSURANCE AND THE COMMERCIALIZATION OF SPACE, 3-10 (Comm. Print 1985) (detailing development of satellite coverage, including casualty coverage exceeding \$100 million per launch and liability coverage as high as \$750 million per launch, despite extremely limited experience base).

90. Some experts have predicted that the contraction in pollution markets will be short-lived, even if EPA fails to tighten coverage requirements and to expand their scope. See, e.g., Finlayson, *EIL Market Could Rebound, Panelists Say*, BUS. INS., Apr. 29, 1985, at 44; see also MacIntyre, *supra* note 75, at 67 ("There is enough science to determine the degree and duration [of hazardous waste risks].") (statement of Michael J. Murphy, chief operating officer of Risk Sciences International).

2. *Promoting Insurance-Based Incentives for Hazardous Wastes*

Both RCRA and CERCLA financial responsibility provisions provide potential bases for beneficial insurance-based incentives. RCRA financial responsibility could engender more effective safety incentives if two changes were made. First, EPA should revise the rules governing closure and post-closure coverage for TSDF's to require guarantees of adequate closure and maintenance, rather than savings pegged to unreliable and self-serving closure cost estimates.⁹¹ In addition, EPA should mandate higher levels of occurrence-based coverage for third-party claims.⁹² However, cost internalization at TSDF's is likely to be limited by well-founded concerns about the effects of cost increases on the incidence of illegal dumping.

Promotion of insurance-based incentives under CERCLA will require two significant statutory changes. First, Section 107(c)⁹³ should be amended, prospectively, to limit generators' and transporters' liability to damages attributable to wastes that they have generated or transported. Damages from future releases involving wastes from multiple sources should be apportioned on a volumetric basis, with appropriate weighting for factors such as toxicity and propensity to migrate.⁹⁴ If applied to releases of wastes that were disposed of before the RCRA tracking system was implemented, this reform would undermine cost recovery efforts by imposing impossible burdens of proof on the government and private claimants.⁹⁵ Apportionment rules should be changed, therefore, only with respect to wastes tracked under the RCRA waste manifest system. Liability with respect to wastes disposed of before, or in disregard of, RCRA tracking requirements should be determined under the existing joint and several standard.⁹⁶

91. See *supra* note 55 and accompanying text.

92. See *supra* notes 56-59 and accompanying text.

93. 42 U.S.C. § 9607(c) (1982).

94. *United States v. A & F Materials Co.*, 578 F. Supp. 1249, 1256 (S.D. Ill. 1984), adopted a "moderate approach to joint and several liability." The court looked to the Gore Amendment, a joint and several liability provision that had been adopted by the House but rejected by the Senate and the House-Senate conferees during Congress' consideration of CERCLA. The Amendment would have directed courts to apportion liability among contributors to a release site based on six criteria, including the amount and toxicity of the waste contributed. *Id.* In view of Congress' ultimate rejection of these provisions, other district courts have understandably declined to apportion liability. See *supra* note 66.

95. See *Superfund Improvement Act of 1985: Hearings on S. 51 and S. 494 Before the Senate Comm. on Environment and Public Works*, 99th Cong., 1st Sess. 52 (1985) (testimony of F. Habicht, Assistant Attorney General, Lands and Natural Resources Division, U.S. Dep't of Justice) (Superfund litigation concerning existing sites would become "extraordinarily costly and cumbersome without joint and several liability."); Comment, *supra* note 65, at 10,225 (discussing evidentiary justification for joint and several liability).

96. Even if given only prospective effect, this reform will reduce the fraction of cleanup costs that can be recovered from private parties, thus requiring increased contributions from other sources. Ex-

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Second, Congress should amend the CERCLA requirement that insurers provide "first dollar"⁹⁷ coverage to permit contracts that make insureds directly liable for certain deductible amounts. Such a revision would not significantly affect recoveries but could substantially reduce the costs to insurers of enforcing policy conditions.⁹⁸

III. CONCLUSIONS

This Note has argued, based on both theoretical considerations and the performance of existing regulatory policies, that insurance-based incentives could contribute significantly to the control of risks associated with hazardous wastes. Given appropriate liability standards and a relaxation of restrictions on incentive mechanisms in insurance contracts, incentives engendered by financial responsibility requirements under RCRA and CERCLA could provide badly needed reinforcement of regulatory controls.

The proliferation of relatively low-cost technologies with the potential to create enormous public harm suggests a growing role for financial responsibility requirements. Areas in which rapid technical change outpaces regulatory adjustments, such as genetic engineering⁹⁹ and chemical engineering,¹⁰⁰ may be particularly appropriate fields in which to supplement regulation with insurance-based incentives. In these and other areas in which asset limitations can undermine the deterrent effects of liability

panded funding from feedstock taxes and general appropriations, the initial sources of Superfund revenues, would impose greater costs on some firms (such as generators that cannot be linked to existing sites) and on taxpayers. These cost shifts are amply justified, however, by the benefits of promoting insurance-based incentives.

97. 42 U.S.C. § 9608(c) (1982); see *supra* notes 71-72 and accompanying text.

98. Greater regularity in the relationship between the behavior of insureds and consequences for insurers would also be promoted by regulations that clarified the goals of CERCLA cleanups (i.e., that resolved the "How clean is clean?" issue) and established procedures for assessing natural resource damages. EPA's existing regulatory cleanup standard, 40 C.F.R. § 300.68(j) (1984), "[a]t best . . . only repeats rather than implements the [broad] statutory goal," providing little guidance for estimates of potential liability in particular situations. See Brown, *Superfund and the National Contingency Plan: How Dirty is "Dirty"? How Clean is "Clean"?*, 12 *ECOLOGY L.Q.* 89, 127 (1984). Similarly, the Department of Interior, charged with developing a mechanism for assessing natural resource damages under CERCLA, has yet to provide any guidance concerning potential liability, despite a December 1982 statutory deadline for promulgation of resource damage standards. See 42 U.S.C. § 9651(c)(1) (1982). See generally Comment, *Theories of State Recovery Under CERCLA for Injuries to the Environment*, 24 *NAT. RESOURCES J.* 1101 (1984) (proposing theories under which states could recover in the absence of authoritative guidance).

99. For a description of existing legal controls over genetic engineering, see Karny, *Regulation of Genetic Engineering: Less Concern About Frankensteins but Time for Action on Commercial Production*, 12 *U. TOL. L. REV.* 815 (1981).

100. The virtual breakdown of the pre-testing mechanism that Congress intended to establish under the Toxic Substances Control Act suggests that insurance-based incentives could provide a particularly useful supplement to regulation in the control of risks posed by new chemical substances. See U.S. GEN. ACCOUNTING OFFICE, *ASSESSMENT OF NEW CHEMICAL REGULATION UNDER THE TOXIC SUBSTANCES CONTROL ACT* (1984).

rules, policies informed by an awareness of the advantages and prerequisites of insurance-based incentives could significantly reduce the combined costs of accidents and avoidance measures.

IV. POSTSCRIPT

On October 17, 1986, as this issue was going to press, President Reagan signed the Superfund Amendments and Reauthorization Act of 1986.¹⁰¹ The amendments include important revisions to CERCLA's financial responsibility terms. These revisions enumerate financial responsibility options,¹⁰² shorten the phase-in period for financial responsibility regulations,¹⁰³ and require parties seeking to recover for cleanup costs or natural resource damages to press claims directly against responsible parties (rather than against financial guarantors) unless responsible parties are insolvent or outside the jurisdiction of the federal courts.¹⁰⁴ The last of these revisions essentially eliminates the preexisting first-dollar coverage requirements, and should, for the reasons discussed above, reduce the costs of enforcing useful incentive conditions in financial responsibility contracts.¹⁰⁵ Other provisions of the 1986 amendments revise portions of CERCLA that are also relevant, though less important than the financial responsibility terms, to the preceding analysis. These provisions suspend transfers of liability for releases from closed facilities to the Post-Closure Liability Trust Fund, pending completion of a study of post-closure costs by the Comptroller General;¹⁰⁶ impose stricter, more precise standards for completion of CERCLA cleanup actions;¹⁰⁷ and require promulgation of regulations for assessing natural resource damages within six months of the enactment of the amendments.¹⁰⁸ The amendments do not, however,

101. Pub. L. No. 99-499, 1986 U.S. CODE CONG. & ADMIN. NEWS (100 Stat.) 1613 (to be codified in scattered sections of 26 U.S.C. and 42 U.S.C.).

102. Pub. L. No. 99-499, § 108(a), 1986 U.S. CODE CONG. & ADMIN. NEWS (100 Stat.) 1613 (to be codified at 42 U.S.C. § 9608(b)(2)).

103. Pub. L. No. 99-499, § 108(b), 1986 U.S. CODE CONG. & ADMIN. NEWS (100 Stat.) 1613 (to be codified at 42 U.S.C. § 9608(b)(3)). This amendment reduces the adjustment period for any regulations that are eventually promulgated, but, like the original legislation, imposes no deadline for promulgation. See *supra* notes 61-62 and accompanying text.

104. Pub. L. No. 99-499, § 108(c), 1986 U.S. CODE CONG. & ADMIN. NEWS (100 Stat.) 1613 (to be codified at 42 U.S.C. § 9608(c)). This revision applies only to releases from land-based facilities; financial guarantors for ships remain liable for first-dollar coverage. Compare *supra* notes 71-72 and accompanying text.

105. See *supra* notes 71-72, 97-98 and accompanying text.

106. Pub. L. No. 99-499, § 201, 1986 U.S. CODE CONG. & ADMIN. NEWS (100 Stat.) 1613 (to be codified at 42 U.S.C. § 9607(k); see *supra* note 40).

107. Pub. L. No. 99-499, § 121, 1986 U.S. CODE CONG. & ADMIN. NEWS (100 Stat.) 1613 (to be codified at 42 U.S.C. § 9621). This provision clarifies the indeterminate statutory language on cleanup standards discussed *supra* note 98.

108. Pub. L. No. 99-499, § 107(e), 1986 U.S. CODE CONG. & ADMIN. NEWS (100 Stat.) 1613 (to be codified at 42 U.S.C. § 9607(f)(1)-(2)). This provision replaces the three-year deadline, now lapsed, set forth in the original legislation. See *supra* note 98.

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alter CERCLA's liability standards.¹⁰⁹ The argument for changes that would allow financial guarantors to predict liability on the basis of safety practices, therefore, loses none of its force.¹¹⁰

109. Section 113(b) of the amendments, Pub. L. No. 99-499, § 113(b), 1986 U.S. CODE CONG. & ADMIN. NEWS (100 Stat.) 1613 (to be codified at 42 U.S.C. § 9613(f)) expressly authorizes contribution actions by parties held jointly and severally liable under 42 U.S.C. § 9607(a). This provision, however, like the Act's prior authorization of contribution actions under state law, *supra* note 66, does not provide a reliable limit on generator liability because of the likelihood that joint tortfeasors will be unidentifiable or judgment proof.

110. *See supra* notes 64-70 and accompanying text.