Journal of Hazardous Materials, 14 (1987) 149—163
Elsevier Science Publishers B.V., Amsterdam — Printed in The Netherlands

RESPONDING TO HAZARDOUS WASTE SITES: SHARING THE RESPONSE RISKS

EDWARD YANG and MARK JOHNSON

PRC Engineering, 1505 Planning Research Drive, McLean, VA 22102 (U.S.A.)

(Received July 2, 1986; accepted July 18, 1986)

Summary

The EPA faces a challenge in indemnifying the Superfund response action contractors (RACs) so that cleanup of the nation's hazardous waste sites will not be interrupted. Although such a program is currently justified by the absence of Property and Casualty (P&C) insurance coverage for RACs, the Government seems to be avoiding a long-term presence as a surrogate P&C insurer. Given the cyclical nature of the P&C commercial insurance market, care should be taken so that the indemnification program does not obstruct reentry of commercial insurers.

To walk this fine line between assuring the availability of qualified RACs and encouraging the availability of commercial P&C liability insurance to RACs, the EPA indemnification program first should recognize the basic economic forces of the pullution liability insurance marketplace. The analytical framework in this paper has provided a starting point toward understanding these forces and developing a least-intrusive indemnification scheme. The conceptual design of the scheme should be based on three criteria: (1) continuing the Superfund cleanup program, (2) providing technical assistance to the P&C insurers, and (3) maintaining the RAC demand for commercial pollution liability coverage. Implementation of such indemnification poses difficulties in the areas of constructing coverage limitations, deductible levels, and other terms and conditions. Policy decisions in these areas will not be easy because of a lack of actuarial loss data and the change in the risk distribution pattern effected by these decisions.

1. Introduction

One of the cornerstones of the Superfund Program under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) has been the availability of qualified response action contractors (RACs). These contractors, operating either for the Environmental Protection Agency (EPA) or potentially responsible parties (PRP), have developed into an industry specializing in addressing the nation's hazardous waste sites. Because of the hazardous contaminants managed on these sites and the uncertainty surrounding the new response technologies, the response action contractors face numerous potential liabilities if a site releases new hazards during or after the remedial response. In the past, these contractors have relied primarily on a combination of commercial property and casualty (P&C) liability insurance and government indemnification to sufficiently offset the liability

risks (e.g., third-party suits) from their business activities. Currently RACs who participate in the Superfund cleanup program are provided with government indemnification, above a $1 million liability insurance policy or self-insurance layer, for third-party liability and cleanup costs, except for cases that involve gross negligence. However, the recent retreat of the commercial P&C insurance industry from the pollution liability market is threatening contractor withdrawal from the hazardous waste site business [1]. With the expected heavy load of site responses for the forthcoming years, any reduction in the capacity of the response industry may adversely affect the Superfund Program [2].

The Congress, concerned about a withdrawal of the response action contractors, incorporated language into the existing CERCLA reauthorization bills authorizing EPA to provide indemnification against liabilities for negligence to contractors on a discretionary basis*. EPA indemnification will apply to all EPA approved RACs and their subcontractors working under the Superfund cleanup program for EPA, another Federal agency, states, or PRPs involved in cleanups of CERCLA sites. These provisions, if enacted, will represent an important development in the distribution of risks from discharges of hazardous substances managed at Superfund sites. In essence, the Government, much like in the case of the nuclear energy industry, will be stepping into the private sector as a temporary surrogate unsurer**. This direct substitution or supplement of commercial insurance will significantly ensure the nation's technical ability to remedy its uncontrolled hazardous waste sites. On the other hand, this action could promote the RACs contractors' unnecessary, long-term dependence on the Government and may discourage commercial P&C insurers from taking over the role of risk-pooling.

This article uses a simple economic framework to examine the above issues and presents some of the key factors and conditions that will influence the efficiency of the Government's role as an insurer. The choice of an economic framework is based on the perception that the Government's role may be a temporary one, and that, although the Government will attempt to operate as a commercial, surrogate insurer, it will not intervene in the fundamental mechanism of the marketplace for P&C insurance. This article focuses on some of the key criteria that the Government should fulfill in order to efficiently implement the indemnification program.

---

*S.51 and H.R.2817. These Senate and House Bills are in Conference now and are expected to produce a reauthorized CERCLA in two months.

**There are important distinctions between the CERCLA reauthorization bills and the Price-Anderson Act. For example, the CERCLA bills do not cap the liability level. Also, the 1975 Amendments to the Price-Anderson Act installed a nuclear facility retrospective premium that eventually phased out the Government's indemnification program for the nuclear energy facilities. The CERCLA bills require no premium from the RACs contractors.

Analytical framework

The P&C insurance marketplace

The marketplace for pollution liability insurance should be no different from other highly specialized insurance lines*. There is no inherent reason why pollution liability cannot be insured, since it includes the traditional bases of insurability: spread of risk, randomness, and technological and scientific data [3]. The P&C insurers supply the service of protecting various companies from devastating liabilities resulting from environmental accidents that occur with a small probability. Pooling individual pollution risks to a large underwriting resource is efficient from both the companies' and society's perspectives [4]. For homogeneous risks, having each company hold its own risk reserve is unaffordable from a company's view and inefficient from the society's view. Therefore, these companies are willing to pay a premium to transfer a majority of their operating risks to an insurance company and its reinsurers.

On the other hand, insurers accumulate a large risk reserve and are willing to sell the backing of this reserve for a premium. This willingness to sell constitutes the supply for insurance. This marketplace can be represented by Fig. 1, where the market demand and supply for the insurance are shown as curves D and S, respectively. The horizontal axis represents units of coverage and the vertical axis the insurance rate (i.e., price per unit of insurance, usually in $100 or $1,000 increments). Curve D slopes down because as the premium rate rises, the companies buy fewer units of coverage, or, equivalently, expand their own risk-retention level (e.g., by increasing deductibles). Curve S slopes up because as the insurance rate rises, the insures, given sufficient policy-holder surplus, expand underwriting resources and increase the available units of coverages. Under normal circumstances, the marketplace clears at A, and W^* and C^* are the equilibrium rate and units sold, respectively. It does not mean that at this point all the buyers' risks are transferred to the insurance companies; given the W^* insurance rate, the buyers have reached an equilibrium risk-retention level.

---

*This article defines pollution liability insurance as coverage "sudden and accidental" and "nonsudden" (gradual) releases of hazardous substances. Although a limited amount of Environmental Impairment Liability (EIL) is available in the marketplace, such coverage excludes professional activities and therefore is not a viable risk transfer mechanism for RACs. In addition, the new 1986 ISO Commercial General Liability (CGL) policy excludes coverage for all pollution-related incidents (a pollution liability endorsement is available but is not currently being offered to RACs). In the past year, the P&C insurance and reinsurance industries have generally incorporated a broad "pollution liability exclusion" in to liability policies they underwrite (e.g., professional liability policies). Lack of a viable EIL form, recent changes in the standard CGL policy form, and an absolute exclusion of pollution-related liability from professional liability policies has left RACs without a source of commercial liability insurance to reasonably offset the potential liability associated with remedial response work.

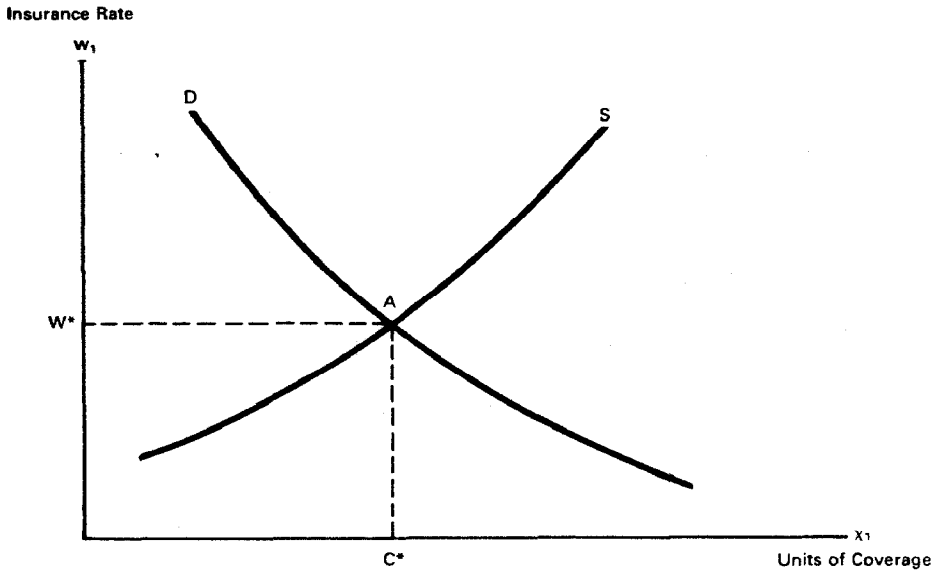

Fig. 1. Marketplace for insurance coverage.

The demand and supply functions for insurance

Recent discussion on the insurance crisis has evolved mostly around the supply side of this market — diminishing coverage availability and rising premium rates. However, from the perspective of implementing a Government indemnification program, understanding the RAC demand for insurance is important. For this reason, we start addressing a demand function for insurance in this section.

The demand for P&C insurance coverage is no different from the production demand for inputs such as raw materials. Insurance is even substitutable because low insurance coverage can mean increased effort on loss control in design, construction, and monitoring of the product. As with other inputs, the demand for insurance, therefore, is derived from the profit maximizing function of a company, depicted in the following equation:

$$P = FR - \Sigma_i x_i w_i \qquad i = 1, \ldots, n \tag{1}$$

where P is the profit, F the price it commands, R is the production of the commodity (site responses), x_i the ith input used in the production, and w_i is its price. In our example, when $i = 1$, the input is the number of insurance coverage units. Therefore, the first term on the right-hand side is the total revenue and the second term, total cost. In the case of hazardous waste site responses, this typical profit equation needs another term added to it:

$$P = FR - \Sigma_i x_i w_i - b(R)[M + D - C(x_1)] \tag{2}$$

where M is the liability loss the contractor may sustain if a release occurs, $b(R)$ is a cumulative probability density function of occurrence from under-

taking R number of responses, D is the deductible and C the coverage, which is the function of the number of coverage units bought, x_1. The last term is essentially the net expected impact on the insured once an incident occurs. The demand for insurence, x_1, can be derived from eqn. (2). The input demand equation can be derived from the first-order conditions of maximizing the profit equation [5]. This demand function will include the above variables:

$$x_1 = f_d(w_1, w_i, F, M, b(R), M, D) \qquad i = 2, \ldots, n \tag{3}$$

With the exception of the insurance rate, w_1, and the deductible level, D, increases in the other variables will increase the demand for insurance coverage, including other competing input prices.

On the supply side, the availability of insurance coverage depends on the cost of providing the coverage and the necessary risk reserve that minimizes the probability of the insurer's insolvency. In general, the supply function would take the following form:

$$x_1 = f_s(w_1, U^0(v)) \tag{4}$$

where U^0 is the minimum risk reserve the insurance company would have to have for a tolerable probability of insolvency [6]. Typically, this reserve is also a positive function of the perceived uncertainties surrounding the loss incidents. Such uncertainties may be represented by an estimate of a variance parameter, v, of the probability density function, $b(R)$. In underwriting hazardous waste liability risks, this reserve size is especially sensitive to this variance term. Both better risk management practices and underwriting procedures can reduce this expected variance and, in turn, the size of the reserve. The insurance rate, w_1, meanwhile, has to cover the pure premium (expected losses), loading for administrative costs, and return for taking the risk (safety loading).

Equations (3) and (4) determine the demand and supply curves respectively in Fig. 1. The variables in these equations ultimately set the environment of the insurance marketplace. The recent insurance shortage is an example of how some of these variables (e.g., uncertainties surrounding the loss incidents) can shift the demand and supply of the marketplace.

The recent insurance shortage

Beginning in 1984, the P&C insurance industry began withdrawing its financial capacity from the pollution liability insurance market. Currently, the market for pollution liability insurance is in a state of collapse with only two U.S.-based firms offering stand-alone Environmental Impairment Liability (EIL) coverage [3]. More specifically, the reinsurance capacity (the secondary insurance market for distributing risks) for pollution liability coverage has been dwindling. Without a reinsurance market, primary insurance companies cannot individually underwrite pollution liability risks (i.e., primary insurers also need to distribute their risks). Undoubtedly, some of the finan-

cial capacity was withdrawn from pollution coverage because of the P&C industry's record underwriting losses (i.e., $21 billion in 1984 and $25.2 billion in 1985), which can be traced to the rampant price competition of the early 1980's, an era in which insurers were eager to write as much business as possible to take advantage of high interest rates [7]. This phenomenon is known as "cashflow" underwriting. The record underwriting losses experienced by the P&C industry in 1984 and 1985 have led to inadequate loss reserves and a shortage of financial capacity to underwrite many forms of insurance coverage [8]. Nevertheless, there are three other primary factors which make underwriting pollution liability insurance progressively unattractive relative to other insurance lines. First, court interpretation of the pollution exclusion in old CGL policies in favor of the insured (i.e., considering the provision to be ambiguous and elaborate) has increased the insurers' exposure to pollution liabilities. Second, insurers have been reluctant to invest in developing adequate techniques and risk quantification procedures for underwriting pollution liability risks because of their significant cost [9]. Further, the paucity of data on health effects, fate and transport of contaminants, waste management technologies, and changing regulations has made risk quantification for insurers potentially complex and expensive.

The total impact of the above factors is a shortage in the pollution liability insurance supply as depicted by the leftward shift of the supply curve in Fig. 2 from S to S'. Not only has the supply shifted to the left, caused by the reduction in underwriting capacity, U^0, but also it became less elastic with respect to premium rates, (higher slope along S'). The latter effect

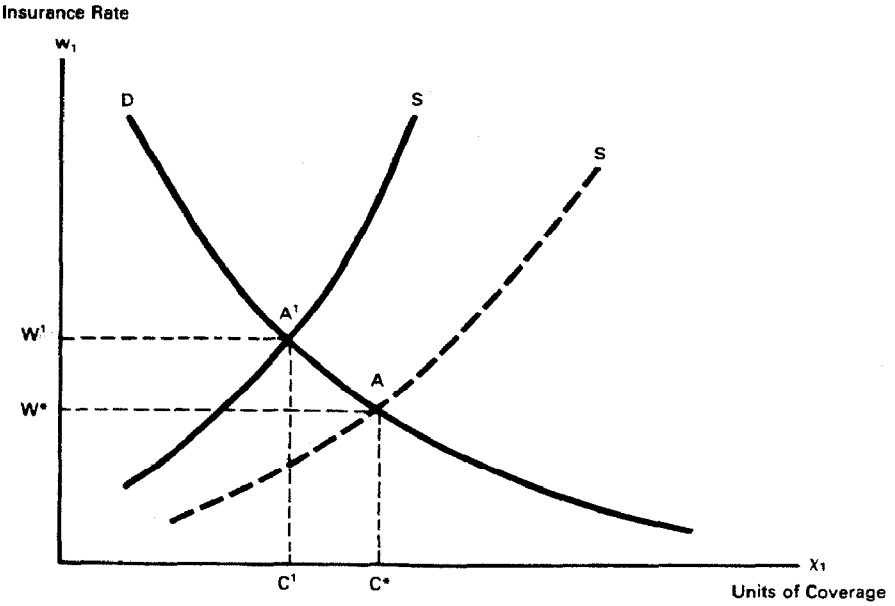

Fig. 2. Diminishing supply for pollution liability insurance.

means that now it takes a higher increase in insurance rates to draw an insurer into the market. The ultimate result consists of higher insurance rates, W', and reduced coverage units, C'.

Government intervention

If the hazardous waste management industry, such as the Superfund response action contractors, pulls out of the hazardous waste cleanup market, the cost of the shortage in pollution liability insurance coverage is ultimately borne by the public. The Superfund program is especially vulnerable to this withdrawal because a delay in response action or use of unqualified contractors may pose direct risks to the public's health and environment. Congress is taking no chance on the possible withdrawal of response contractors. Both Superfund bills contain provisions for the EPA to indemnify response action contractors. Such a move essentially calls for the EPA to become a temporary surrogate insurer until the P&C insurance market condition changes favorably.

Such a Government intervention may be justified because of the inherent structure of the P&C insurance market. One aspect of this structure is the cyclical nature of the insurance industry's profit level (see Fig. 3). The wide fluctuation of profit levels have traditionally produced either excess demand or excess supply for insurance coverage. In a period of

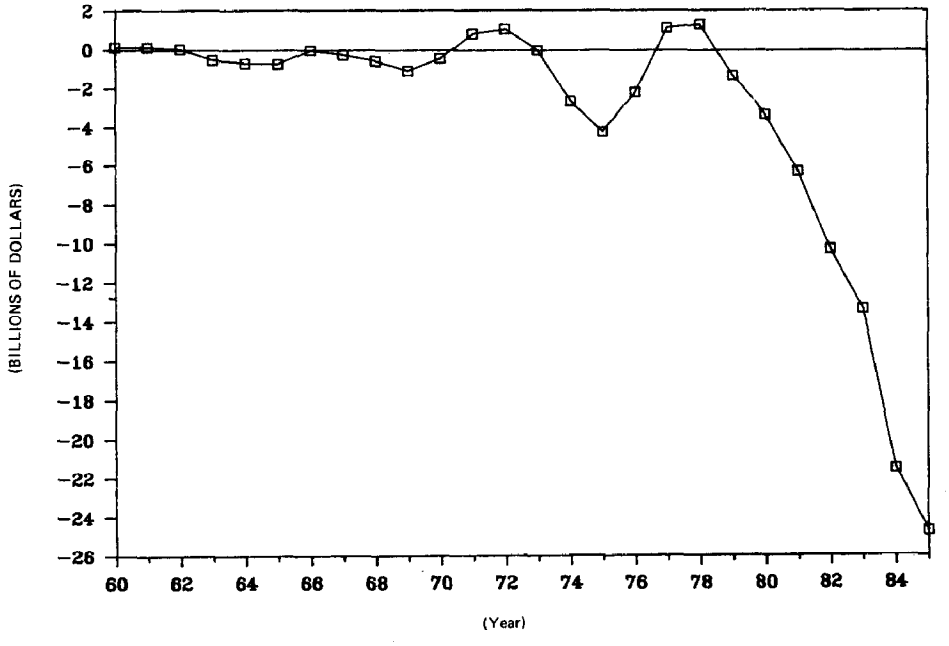

Fig. 3. Property and Casualty Industry — Cyclical underwriting profit (loss). (Source: A.M. Best Company, Inc., Best's Aggregates & Averages.)

excess demand, policyholders are often unable to secure adequate, affordable insurance coverage, and may have their policies nonrenewed or cancelled. Conversely, in the excess supply period, insurers undercut insurance rates below the true cost of the coverage. These ups and downs can be inefficient economically because they distort the true cost of insurance coverage.

The second aspect of the P&C insurance market is the extent of regulation [10]. Regulations may have discouraged new firms from coming into the market during periods of low insurance availability. Government regulation of the insurance industry is mandated by Public Law 15, the McCarran-Ferguson Act of 1945. This Federal statute exempts insurers from Federal antitrust laws to the extent that their activities are regulated by the states, thus delegating the primary responsibility for regulating insurance to the states. States enact their own insurance legislation and implement the ensuing regulations through state insurance commissioners. The general goals of state insurance regulations are: (1) insurance costs and contracts should be "fair, reasonable, and not excessive" (i.e., equitable to the insurance buyers), (2) insurer solvency should be maintained by assuring that insurer rates and reserves are adequate, and (3) insurers should be regulated in such a way as to make essential insurance protection as readily available to the public as is practicable. The stringency and complexity of the regulations, of course, vary by state. Thus, potential insurers have to surmount numerous state regulatory requirements and accept the state insurance commissioners' interventions into decisions on various aspects of the business. This burden is especially onerous for potential entrants who try to obtain licenses to write insurance in more than one state.

The third aspect is that the P&C industry often has high entrance barriers in terms of capital requirements. Even if one can surpass state regulatory requirements, the amount of reserve capital a new insurer has to amass limits the number of candidates. This is especially true of the pollution liability insurance line because of the potential high cost to properly underwrite the risks' potentially large losses and the long-term nature of the risks.

These aspects constrain the industry from responding quickly to new demands. The renewed surge in the use of offshore captives has shown that only when exempted from state regulation and when backed by numerous large firms can new insurance entities emerge in response to excess demand. Instead of waiting for the insurance industry to realign itself to the new demands, the EPA may determine that the cost of slowing down the Superfund cleanup program may warrant temporary intervention into the supply of liability coverage to the response action contractor.

There are, of course, dangers for EPA in playing this surrogate role. An overly protective indemnification mechanism may result in long-term Government subsidization of the response action contractor industry. Such subsidization may temporarily fix the existing situation at the cost of alienating the P&C insurance industry from the pollution liability market. The follow-

ing three sections deal with a few of the criteria that the program should consider in implementing the indemnification program.

Continuing the Superfund program

The primary thrust underlying the Government's move toward indemnifying the Superfund response action contractors (RACs) is the goal of pushing ahead with Superfund cleanups. This goal assumes the availability of high-quality cleanup contractors for all phases of the program (i.e., site investigation, risk assessment, response selection/design, and construction). Because of the sudden withdrawal of the P&C insurance industry from all pollution-related coverages and the controversial nature of Superfund responses, many of the existing RACs cannot justify the liability risks they bring to their corporate structure.

One of the criteria for the Government indemnification program, therefore, is to keep qualified RACs within the cleanup industry. But the optimal level of indemnification, defined by limits, deductibles, and other requirements, that is necessary to maintain the present level of contractor availability is extremely difficult to define. Such difficulty is clear if we re-examine eqn. (2)

$$P = FR - \Sigma_i x_i w_i - b(R)[M + D - C(x_1)]$$

As explained in the Analytical Framework section, the demand for insurance or indemnification is part of the intricate corporate profit function. Typically, insurance, being one of the inputs into response actions, "allows" R, the response actions to bring in profit. The relationship between insurance and the level of response action depends on the "risk avoidance" function of the corporate structure. More simply put, how much indemnification or insurance does a RAC corporate structure need for a given level of response contract activity and a given level of expected liability. Typically, a corporate risk-avoidance function is determined by the firm's dependence on its specific line of business, the percentage of assets endangered by the liability arising from the business, and the corporate business attitude (e.g., aggressive vs. conservative). The net indirect contribution of insurance to the profit function for a given time can be explicitly examined by taking the derivative of eqn. (2) with respect to x_1

$$\partial P/\partial x_1 = F\,(\partial R/\partial x_1) - w_1 - (\partial b(R)/\partial x_1)\,(M + D - C(x_1)) + b\,(R)\partial C/\partial x_1 \quad (5)$$

The term $F\,(\partial R/\partial x_1)$ is the contribution of an additional unit of insurance to profit. This first positive component is countered by the remaining two components on the righthand side. One of them, w_1, of course, is the price one has to pay to obtain the insurance. In the case of indemnification, this component is zero. The last two components are the change in RAC's net expected liability from the additional unit. The above-mentioned risk-avoidance function is represented by the term, $\partial R/\partial x_1$, which becomes larger

as a firm becomes more willing to sustain higher levels of responce action with a given level of insurance. As a multiplier of the profit term, F, a larger $\partial R/\partial x_1$ increases profit. But a resulting higher level of response action will increase the probability of incidents, as the term $\partial b(R)]\partial x_1$, shows. The break-even point for a RAC to remain in the cleanup industry is:

$$F(\partial R/\partial x_1) - (\partial b(R)/\partial x_1)(M + D - C(x_1)) + b(R)\partial C\partial x_1 = 0 \quad (6)$$

In essence, Government indemnification has to bring the RAC just above this break-even point through the control variables of x_1, indemnification level; D, deductible level; and other terms and conditions. This task is clearly difficult because the risk-avoidance function is often unique to the corporate structure and unquantifiable. Additional research may be needed on how to measure the variables in eqn. (6).

Providing technical assistance to the property and casualty insurance industry

The proposed government indemnification program is intended to encourage the P&C insurance industry to stay in the hazardous waste market and expand its role in providing pollution liability coverages to RACs. One way to achieve this goal is for the EPA to provide technical assistance in the development of standardized underwriting techniques for the P&C insurance industry. In fact, because of its mandate in addressing the nation's hazardous waste management problems, the EPA possesses extensive experience and knowledge regarding the potential risks related to waste sites. Meanwhile, the size of the hazardous waste liability insurance market may not justify the P&C industry to make large resource expenditures to better understand these risks. This situation allows the EPA to reduce the perceived uncertainties surrounding these risks by providing technical assistance to the insurance industry. Based on eqn. (4), technical assistance will produce two effects. One is reducing the underwriting cost, affording a lower insurance rate, w_1. The other is reducing the perceived uncertainties surrounding the risks at hazardous waste sites (a smaller v). The latter effect should reduce the size of the necessary reserve. Ultimately, through these two effects, technical assistance may stimulate the private supply of pollution liability coverage.

At the same time, there is strong evidence that such technical assistance will be well received by the P&C insurance community. A 1985 survey of 350 companies that write property and casualty insurance shows that one major reason for the disappearance of gradual pollution insurance is that insurers perceive the underwriting of pollution risks as being highly specialized, requiring expertise beyond the normal capacity of most insurers [9].

Systematic RAC exposure identification and risk analysis

Exposure identification and risk analysis are likely to play an important role in developing the Government's indemnification program. Unlike commercial insurance, where the marketplace is the ultimate judge of an insurer's assessment of risk, regardless of its method, the EPA may have to demonstrate that the terms and conditions of its indemnification program are based on the best available data and analysis. In developing the indemnification program, EPA should first identify the liability risks that RACs will be exposed to during and after the remedial work (i.e., potential longterm losses). For example, a site that has undergone a Superfund remedy is often similar to a site permitted under the Resource Conservation and Recovery Act (RCRA)*. Through its permitting process, the EPA has the best available data on the risk potential of these RCRA sites. The EPA also has already made substantial effort in standardizing exposure and risk analyses at Superfund sites for the purpose of selecting the appropriate remedial responses [11].

Potential RAC liability can be thought of as a function of the components shown in Fig. 4. The top box contains the events that may lead to damages.

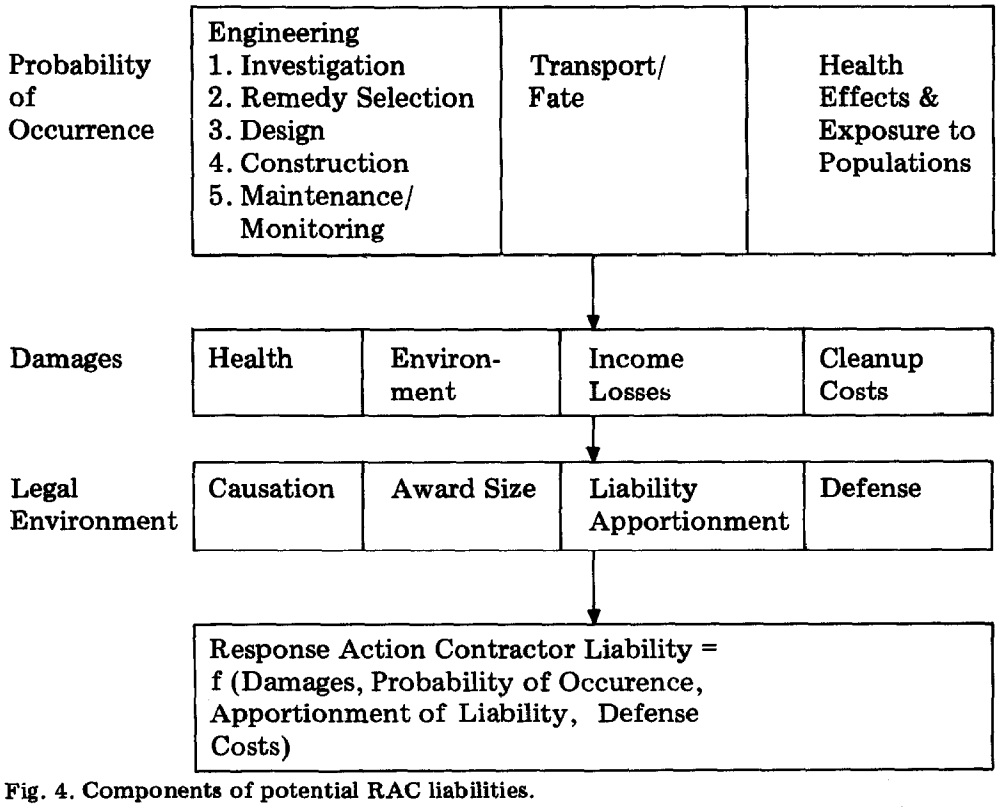

Fig. 4. Components of potential RAC liabilities.

*The authors thank Robert Mason of the U.S. EPA for making this point.

All three types of events — engineering/construction, fate and transport of contaminants, and exposure/health effects — interact to define the probability and magnitude of an occurrence that will lead to RAC liability. The second component relates to damages that may result from an occurrence. Some of these damages will be quantifiable in terms of dollars and some of them will not. The third component is the crucial legal linkage where proof of causation, award size, the defense cost, and liability apportionment to the RAC will ultimately determine the impact on the RAC. Although it is difficult for EPA to quantitatively determine these components, explicit recognition and delineation of the key assumptions surrounding them will help insurers improve their professional judgment. Only by adequately identifying the potential sources and causes of future RAC liability losses can the P&C insurance industry begin to consider whether the RAC insurance market is a viable one.

Development of a comprehensive underwriting approach

Once EPA had developed a standardized approach to assessing exposure and analyzing risks, it will have the methods and information necessary to develop guidelines on how to underwrite the RAC liability risks. In offering interim RAC indemnification subject to limits and deductibles, EPA, in effect, will be acting like a surrogate insurance underwriting department. EPA may select only those contractors who are capable of meeting a specific set of underwriting criteria. The development of these underwriting criteria should reduce the underwriting cost of the commercial P&C insurers and, as eqn. (4) shows, increase the supply of commercial pollution liability insurance.

In developing underwriting criteria, EPA should identify and develop risk management methods which heavily emphasize long-term loss prevention, loss control, and contingency planning. This loss control emphasis will serve to: (1) minimize the Federal Government's indemnification costs related to RAC liability losses, and (2) demonstrate to the P&C insurance that the RAC liability risk is manageable.

Another major task EPA needs to perform when developing its underwriting criteria is to differentiate RACs, who perform different site work activities, into homogeneous risk classes. A RAC who confines its remedial site work to feasibility studies, for example, would naturally represent much less of a liability risk than a RAC who is primarily engaged in site design and construction. Such classification will further clarify the RAC liability risk for determining appropriate EPA indemnification limits and deductibles, and reduce the uncertainty variable, v, in eqn. (4).

Data collection, processing, and retrieval

A major problem that the P&C industry faces in providing prospective pollution liability coverage is the lack of sufficient actuarial loss data, from which insurers set proper insurance rates. During the soft insurance market

(approximately 1978—1983), insurers did not stress the use of sound underwriting or actuarially based insurance rates. Now that insurers have generally returned to sound underwriting and actuarial rate-making practices, it has become apparent, at least for the immediate future, that insurers tend to ignore underwriting liability insurance lines which lack sufficient actuarial loss data. In the course of establishing and administering its interim RAC indemnification program, the EPA will need to identify, collect, assemble, and track the appropriate actuarial loss data that could be used by insurers to estimate RAC losses at the Superfund sites. Once this data base is developed, the P&C industry could use it to again reduce the uncertainty about the RAC risk (a smaller v).

Maintaining the RAC incentive to seek insurance

The other side of providing incentive to the supply of RAC liability insurance is providing incentive to the RAC demand for insurance. More specifically, Government indemnification should seek to maintain the existing RAC demand for commercial P&C insurance coverage while providing RACs with the necessary temporary indemnification. Being aware of this need, Congress has included language in one of the Superfund reauthorization bills stating that RAC indemnification will be provided, only if "the response action contractor has made diligent efforts to obtain insurance coverage from non-Federal sources" [11]. Implementation of this provision, however, may prove to be difficult, as the following discussion will show.

In order to maintain the RAC demand for commercial insurance, the Government indemnification program should operate as if it is supplying coverage to the portion of RAC demand that is not satisfied by the commercial insurers — "residual demand". Figure 5 shows how this concept of residual demand works. Just as in Fig. 1, the horizontal axis represents units of coverage, while the vertical axis represents the insurance rate level. The RAC demand is again represented by the downward sloping curve, and the three supply curves represent the hypothetical supply situations — S-Past, S-Current, and S-Projected. The intersection A represents the past coverage level and the insurance rate (C^2 and W^2) during the 1983/84 soft insurance market (i.e., an insurance market characterized by excess insurance availability and generally lower insurance rates due to competition between insurers for premium dollars). This point A may be considered as the equilibrium RAC risk insurance level before the recent liability insurance crisis. The supply curve S-Current represents the current situation of no available RAC insurance. The supply and demand curves do not intersect and no transaction is taking place, C^0. Now, if in the near future the commercial insurers decide to return to the RAC liability insurance market, S-Current will slowly move to the right and become S-Projected. At this point the private market is willing to provide some coverage at a high premium, W^1. The RACs, at this point, clearly will not get the past equilibrium level coverage, which the

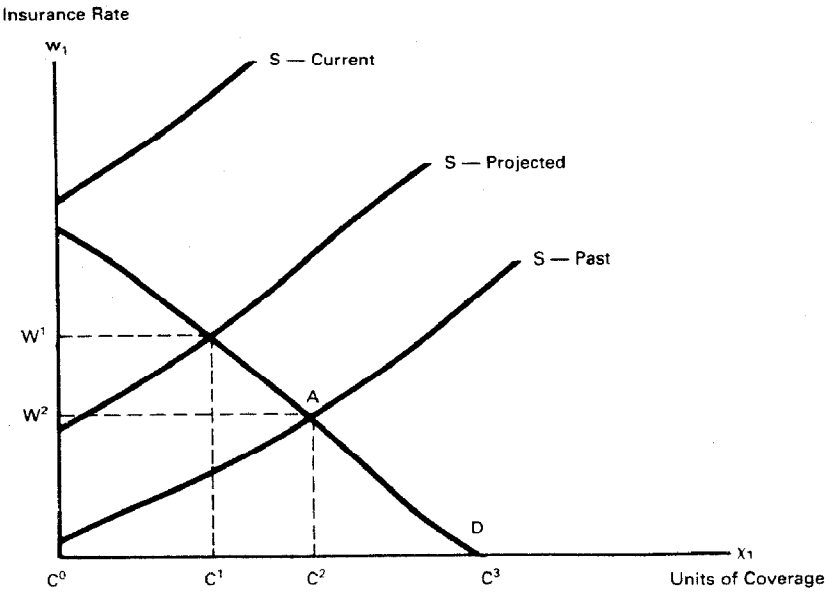

Fig. 5. RACs' residual demand for insurance.

RACs may consider as the appropriate level. If the RACs consider the insurance rate W^1 reasonable, the commercial insurers will provide C^1 level of coverage, the EPA indemnification program will provide the remaining level of coverage from C^1 to C^2. Of course, the program could provide up to C^3 level, if the Government wishes to have all the RAC risks transferred (i.e., zero deductible and no limits). What the indemnification has covered beyond the C^1 level (to the right of it) are the residual demands. Clearly, as more insurance becomes available and the supply curve moves further right, the Government may ease out of the market entirely. Should the indemnification operate with such a smooth transition, there will be no fear that the Government may discourage participation of commercial insurers.

In actual practice, this smooth transition, even if the insurers return to the market, hinges on the ability of the insurers, RACs, and the Government to agree on the premium and the level of coverage that divides the RAC coverage into commercial insurance and Government indemnification (C^1 and W^1 in Fig. 5). Without the marketplace forces operating, it is difficult to assess whether such agreements can be achieved. However, there are a few incentives for all parties to reach agreement on insurance rates with a corresponding coverage level. For example, commercial insurers certainly have an incentive to lower their insurance rates to expand their business base. The Government's interim role will encourage insurers and RACs to agree on what constitutes a "reasonable price". The RACs, although being indemnified by the Government in the short-run, would probably rather establish a long-term relationship with commercial insurers. The RAC should understand that the direction of a Government indemnification program is ulti-

mately controlled by forces beyond the marketplace. One can only hope that these positive incentives will override short-run concerns for profit and loss. In any case, any Government indemnification program should ensure that the appropriate forum is established for negotiations among the three parties.

References

1 S. Diamond, Insurance against pollution is cut, New York Times, March 11, 1985.
2 G. Lucero, Statement of Gene Lucero, Director, EPA Office of Waste Programs Enforcement before Subcommittee on Water Resources, U.S. House of Representatives, July 24, 1985, p. 1.
3 D.A. Tweedy and D.G. Tracy, Surviving the pollution liability crisis, Risk Manage., 32(10) (October 1985) 24.
4 E.C. Venezian, Efficiency and equity in insurance, J. Risk Insur., 51(2) (June 1984) 190—204.
5 H.R. Varian, Microeconomic Analysis, W.W. Norton and Company, New York, 2nd edn., 1984, p. 348.
6 T. Pentikainem, The theory of risk and some applications, J. Risk Insur., 47(1) (March 1980) 16—42.
7 A. Beer, Risk retention act expansion proposed, Bus. Insur., 20(8) (February 1986) 30.
8 J. O'Sullivan, Living with the changing market, Risk Manage., 32(4) (April 1985) 28, 32.
9 All-Industry Research Advisory Council (AIRAC), Pollution Liability Insurance. The Evolution of a Difficult Market, AIRAC, 1985.
10 David, L. Bickelhaupt, General Insurance, Richard D. Irwin, Inc., Illinois, 9th edn., 1974, p. 210.
11 U.S. Environmental Protection Agency, Guidance on feasibility studies under CERCLA, Office of Solid Waste and Emergency Response, Washington, DC, EPA/540/-G-85/003, June 1985.