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ECONOMIC THEORY AS A SUBSTITUTE FOR COST-BENEFIT ANALYSIS IN LOW-ACTIVITY MIXED WASTE RULE MAKING

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ABSTRACT

Cost-benefit analysis is central to explicitly demonstrating the worth of a rulemaking to society as-a-whole. This demonstration is usually in the form of the net benefit to be derived. The thesis of this paper is that under certain, well-defined circumstances, a formal cost-benefit analysis may not be necessary to demonstrate, before the fact, that a rule will result in this net benefit. To this end, this paper examines this thesis in the context of a soon-to-be proposed rulemaking by EPA for low-activity mixed waste. This rulemaking has been put forward by EPA as one that can be predicted in the absence of cost-benefit analysis to have either zero or positive net benefits, but no net cost.

INTRODUCTION

In 1998, the Office of Radiation and Indoor Air (ORIA) of the Environmental Protection Agency (EPA) took a close look at the merits of developing alternative disposal methods for low-activity mixed waste (LAMW). Information from generators and other government entities had suggested that such an option would not only reduce the cost of disposal to generators but would improve public health and safety by encouraging the permanent disposal of mixed waste. After an initial investigation, EPA initiated a rulemaking for LAMW (40 CFR 193) and, concomitantly, a regulatory impact analysis (RIA) (1) was initiated to quantify, to the extent possible, its potential benefits and costs.

Early in the course of performing the cost-benefit analysis (CBA) portion of the RIA, it became evident that insufficient information was available to construct a thorough CBA (more will be said about this later in the paper). The criteria called for in a formal cost-benefit analysis, as outlined under Executive Order 12866 (2) (which stipulates how cost-benefit is to be conducted for Federal rulemaking) could not be satisfied. This prompted ORIA to find alternate methods to justify the proposed standard under conditions of insufficient/nonexistent information. It was decided to bring to bear a somewhat unique element of the Standard, i.e., the fact that it is, for all practical purposes, voluntary. The rulemaking does not change the status quo for mixed waste disposal but instead creates another potential option for generators to utilize at their discretion. This suggests that it should not have an adverse economic impact. The draft RIA prepared for this rulemaking explored this fact and its consequences at length. This paper provides a short summary of that discussion.

THE LAMW STANDARD

The EPA is planning, sometime in 2000, to propose a generally applicable environmental standard for the land disposal of LAMW. The proposed standard, 40 CFR 193, will apply

primarily to commercial mixed waste, although some government waste streams may also be eligible. This proposed regulatory action will address the protection of the general public and ground water by proposing protective conditions for the land disposal of LAMW. The disposal technology to be used is based upon the Resource Conservation and Recovery Act Subtitle C (RCRA-C) hazardous waste disposal requirements (3,4,5). RCRA-C disposal technology has been demonstrated through modeling to be protective of public health for the types of waste covered by the standard.

To bolster public confidence in the proposed disposal method, the EPA is working with the Nuclear Regulatory Commission (NRC), which regulates, along with NRC agreement States, commercial low-level radioactive waste disposal under the Atomic Energy Act (AEA). The NRC plans to issue facility requirements to implement the EPA environmental standard. By doing so, the mixed waste remains regulated under both RCRA and the AEA. Ideally, the requirements for existing RCRA-C facilities to dispose of "low-activity" mixed waste could be simplified significantly over the requirements now in place for siting, construction, and operation of fully-licensed low-level radioactive waste disposal facilities (see 10 CFR part 61).

The EPA recognizes that commercial RCRA Subtitle C facility operators and waste generators will apply the proposed rule only in specific instances by balancing the requirements embodied in the standard against economic and practical considerations. To that end, the EPA standard hopes to simplify the decision-making process for RCRA-C facility operators. By defining "low-activity" waste in the standard based on modeling appropriate for existing RCRA-C disposal facilities, EPA removes the financial and logistical burden of site-specific performance assessments or other analyses. These site-specific analyses represent a significant proportion of a facility's investment in licensing under 10 CFR part 61. The EPA expects the NRC's implementing requirements to minimize cost to disposal facilities by simplifying existing requirements; however, at this time it is not possible to project the form the NRC requirements will take.

Without an appropriate standard, waste disposal management costs for these wastes are expected to remain high. The absence such a standard would also mean the continued storage of such wastes for indefinite times in facilities not designed for long-term storage. The standard is expected to provide the means to readily dispose of a fraction of the mixed waste volume that is currently being held in storage throughout the nation. As a result, it is expected that such waste will be rendered less hazardous through treatment and placement in facilities designed to ensure the protection of the public and environment.

The draft proposed standard focuses on the public health and environmental impacts of waste disposal. The provisions of the standard are commensurate with the relatively low hazard presented by LAMW. The draft proposal also recognizes that the RCRA Subtitle C design requirements and permitting process did not originally address the presence of radioactivity.

The standard will be proposed in the spirit of current Federal efforts to redesign the regulatory process and minimize the regulatory burden, as recommended by the National Performance Review (6). Since the standard applies to waste containing hazardous materials, the proposed

action recognizes that the disposal method being considered here is already governed by Federal and State authorities under RCRA. Accordingly, the standard does not relieve disposal facility operators and commercial waste generators from having to comply with all applicable Federal and State regulatory requirements addressing hazardous materials.

AN OVERVIEW OF COST-BENEFIT ANALYSIS

Stated in its simplest form, the purpose of CBA is to demonstrate in quantitative terms that a rulemaking has a net worth to society as-a-whole. That is to say, when totaled, its benefits will exceed its costs. This is done by quantifying and summing the costs and benefits, typical in any rulemaking, over the life of the rulemaking and expressing them in present terms. Only if the rulemaking can be shown to produce an excess of benefits over costs to society does it pass this net benefits test.

Cost and benefits may be of many different types. Cost may be defined in terms of monetary cost to the public, industry or in terms of insults to the environment, or as health effects caused by an action. Likewise, benefits may be defined as monetary savings to either the public or industry, protection of the environment, or in terms of adverse health effects averted by an action.

Accordingly, a major function of the CBA is to identify the types of costs and cost savings (benefits) expected to result from the rule, if implemented. Generally CBA goes further and, in the case of the LAMW rule, would include qualitative discussions addressing the distribution of the potential benefits/costs among workers, generators, disposal site operators, etc. It would also discuss risks associated with storage, treatment, packaging, transportation, and disposal. Finally, a CBA would identify uncertainties and constraints associated with the implementation of the rule.

To be more specific on the application of CBA, the incremental impacts of a proposed rule would be based on the expected changes in economic costs and health risks as measured from a baseline established by current practice. The expected costs and risks associated with storage, treatment, transportation and disposal practices that would be adopted after implementation of the proposed rule would be compared to this baseline. Typically, a new environmental regulation imposes new requirements or constraints on the affected economic entities, thus increasing their cost of doing business. A traditional CBA weighs these costs against the estimated environmental and health benefits to determine if the additional costs would be justified.

The CBA provides, if not a validation, at least a rationalization of the purpose of the rulemaking. A rulemaking with a major impact (defined as an impact greater than $100 million per year) does, in fact, require what might be considered an "extended" CBA under Executive Order 12866, that is, a regulatory impact analysis (RIA). Under an RIA, the full range of a regulation's costs and benefits should be discussed, quantified to the extent possible, and their distribution analyzed. CBA provides a focus for decision makers on the fundamental economics of rulemaking, emphasizing the tradeoff in resources such a rulemaking may promote, e.g., dollars for a certain level of risk, dollars for dollars.

CBA has been a feature of rulemaking for so long and for so many rules that it is a readily accepted convention that a CBA is always necessary to show that the benefits to society of a rule will exceed the costs of the rule making to society. Anyone with oversight in the regulatory process would want to review the RIA before giving their approval. This is not without good reason. Whenever the government intrudes, in a mandatory way, into the private sector, markets are distorted. There will more than likely be costs and benefits to such an intrusion, yielding both winners and losers. The CBA in this case not only makes explicit all the quantifiable elements like a glorified accounting sheet. Perhaps more importantly, it puts all of this information used in the decision making process out for public view and public comment.

There are of course, certain drawbacks to CBA. In some circumstances, it can become quite complex. It often requires a certain set of assumptions that require a judgement on the part of the analyst. It often leaves the actual question of net benefits unanswered when dealing with nonquantifiables such as human lives. And it sometimes ignores or leaves open the question of how the costs and benefits are distributed.

LIMITATIONS ON CBA IN LAMW RULEMAKING

It has been suggested previously that conventional CBA could not be performed on the proposed LAMW standard, forcing a more theoretical, free market justification. This demands a little more explanation.

The waste covered by the proposed rulemaking itself presents the first order of uncertainty. Some information was, of course, available for the mixed waste generated by the commercial sector. A national profile of mixed waste volumes and characteristics was developed by the NRC in 1992 (7). The results indicate that, based on 1990 practices, commercial facilities annually generated 3,900 m^3 of mixed waste, treated another 4,000 m^3, and held in storage a total of 2,100 m^3. Liquid scintillation fluids account for about 72% of the waste generated and 84% of that treated. Three waste streams account for nearly 65% of the waste volume being held in storage. In decreasing volume, they are cadmium (35%), liquid scintillation fluids (17%), and chlorinated fluorocarbons (12%). Also, the NRC has estimated that a small fraction of the mixed volume was untreatable, ranging from 140 to 524 m^3, as an upper bound. This range represents about 3.5 to 13% of the annual generation rate. However, recent information indicates that the total inventory of mixed waste has been decreasing since 1990, as generators are applying waste management techniques to reduce inventories because of costs and regulatory constraints.

This limited information was, however, insufficient to suggest, for various levels of a standard, the amounts of wastes that might be accepted for disposal. To do so would require more detailed and more current information on commercial sector mixed waste generation rates, volumes, waste forms, and radioactivity levels. Some State and industry sources do have more up-to-date information, but this information is limited in scope and has many of the same limitations as the NRC data. The absence of these critical pieces of information means that the impact of the rulemaking cannot be predicted from the perspective of its impact on waste disposal.

Even if this hurdle were to be overcome, others would still remain. One of these is the fact that it is not known with any certainty what reduction in overall disposal costs is necessary to compel generators to take mixed waste from storage and dispose of it. While the cost barrier is certainly being lowered, the question is, "Is it enough?" The situation is similar with RCRA-C disposal site operators. Not enough is known about the current economics of their operations to predict if the incentives are there for them to gear up to receive mixed waste. As with generators the costs are being lowered, but by how much? And is it enough?

Layered on top of this is the fact that the decision to utilize the rule will depend upon the anticipated waste volumes, incremental operational costs, competition, liability, and requirements imposed by the NRC and State and local governments. As noted earlier, the presence of radioactivity in the waste will require the participation of the NRC and Agreement States for radioactive materials covered by the AEA(8). The role of the LLW Compacts or unaffiliated States is yet to be determined in light of the charters and statutes enacted in response to the Low Level Radioactive Waste Policy Amendments Act of 1985(9). Individual States have the prerogative in deciding whether the proposed disposal method for LAMW will be implemented. If the requirements imposed by the NRC and Agreement States are deemed too costly compared to expected revenues, some facility operators will decide not to implement the rule. Those that choose to participate must consider the specific implementation requirements imposed by the NRC and Agreement States, local siting constraints, worker safety, anticipated demand for this type of disposal services, competitive market forces and the possibility of future changes in LAMW disposal requirements.

CAN THERE BE A VOLUNTARY RULE?

It has been suggested previously in this paper that this rulemaking has a singular feature that would insure, if not a net benefit, then at the very least no net cost to society from its promulgation. This feature is the fact that it may be considered, for all practical purposes, a 'voluntary' standard.

The standard is referred to as being voluntary because it does not require either the generators or disposal site operators to make any change from current practice. They may continue disposing (or not disposing) of mixed waste as they have before the rulemaking. It will not affect current practice in any appreciable way. This may be considered to be the case as the standard simply offers generators another option for disposal for certain types of mixed waste but does not require that they avail themselves of this option. It does not require any change in the status quo. The proposed rule does not impose new requirements that would act to increase the cost of doing business to waste generators. Both generators and disposal site operators may continue to do business as usual and ignore the rulemaking in its entirety.

On the subject of the rule and the status quo, it might be inferred that if this rulemaking were to be successful, it would disrupt current business practice by diverting the waste from already licensed disposal facilities. The point to be made here is twofold. Firstly, the mixed waste volumes involved are relatively small. Their deferral to a RCRA-C site will not be a significant loss to any current disposal site operator. Secondly, the waste being targeted by the rulemaking

is currently being stored, for the most part, and not disposed, which again suggests that its disposal under this rule will not disrupt current business practice.

VOLUNTARY EQUATES TO NO NET COST

More to the point, under these circumstances described above, one can surmise that the utilization of the standard by the private sector for the disposal of mixed waste will depend upon the estimation of generators and disposal site operators of the potential benefits of doing so. They will weigh the costs and benefits of employing such a standard to meet their disposal needs. This would also be the conclusion of an analysis of the situation in terms of the branch of economic theory known as microeconomics.

It is not necessary to know much of microeconomics to indulge in predictions based upon it. If fact, all that is needed is to borrow two of its simplest and most basic tenets: that firms behave rationally and that they strive to maximize profit.

With these two concepts in mind, it becomes easy to apply economic theory to make predictions on the actions of both mixed waste generators and disposal site operators in response to a LAMW rulemaking. One can easily predict that unless the use of the standard is in the interest of generators and disposal site operators, they will not make use of it, assuming they have the choice. To do otherwise would be against their economic interest and would not be rational. Unless the rule produces a net benefit, in whatever form, for them, it will simply not be utilized. It will be ignored and the status quo will be maintained. Thus, the standard cannot induce a cost on the generators.

There is of course the chance that the standard will have zero impact and that it will not be made use of by anyone. This is a possibility with any voluntary rulemaking, and more so with one that is largely dependent on external factors. But it is a risk without a real downside. That is, if the rulemaking were to be done under conditions of complete uncertainty, it would have an upside, real savings and a net benefit to society, and a downside, typically the possibility of a net cost to society. This is not the case in this instance as economic theory suggests only the lopsided result of a zero to positive impact, with no negative side. This rulemaking then cannot be considered a gamble because that implies something put at risk. In this proposed rulemaking, nothing is put at risk (if we can ignore the resources necessary to issue such a rule.

POTENTIAL IMPACTS

For RCRA-C facility operators that elect to implement the rule, there might possibly be some increased cost associated with the requirements of a general or specific license; however, those costs are expected to be minimal and passed on to waste generators such that profit margins will be maintained or increased. Even with this incremental cost, the disposal charges for LAMW are expected to be still well below those currently experienced by radioactive and mixed waste generators. This is believed to be the case in the short run because of the greater number of disposal site operators (and thus more competition) and the inherently lower costs of disposal in a RCRA-C facility versus an LLW (10 CFR 61) facility(10, 11). Generators with relatively

small volumes of mixed waste can expect to pay even more for disposal. The relative economy of LAMW disposal is believed to be even more of a certainty in the long run with the possibility of treatment costs being brought down by both the actions of treatment facilities (development of new mixed waste treatment and management services since the rule provides an outlet for such wastes) and revised waste treatment rules by RCRA authorities.

Of course, potential savings in disposal costs are directly dependent upon on the actions of waste generators, as well as on legal constraints arising from other Federal and State regulations and how the Nuclear Regulatory Commission chooses to implement the approach within the commercial sector. It is expected that waste generators and treatment facilities would utilize this new disposal option to reduce the costs associated with storage and treatment of mixed waste. The cost savings are expected to result from:

- The reduced need for interim waste storage
- The development and availability of new waste treatment techniques
- The development and application of new waste segregation techniques
- Reduced waste transportation costs
- The availability of lower-priced LAMW disposal in RCRA-licensed disposal cells

Indirect returns are also expected from the increased use of testing and research methods that some reports indicate are currently being curtailed due to limited mixed waste disposal options. Although the risks associated with disposal are essentially unchanged, the reduced need for interim storage is expected to reduce storage risks in the long-term. Transportation risks are expected to be reduced as well once local LAMW disposal capacity becomes available.

MAXIMIZING NET BENEFITS SUBJECT TO CONSTRAINTS

Two very different types of constraints were imposed on EPA's ability to analyze the economic impact of our rulemaking. Discussed previously were the information constraints which, in effect, prohibited the performance of a CBA. In the course of conducting a CBA, an options analysis is often performed to discover, given that several options exist for a level of protection at which a standard may be set, at exactly what level of protection net benefits are maximized. Typically, possible optional levels of a standard are arrayed in order of stringency and analyzed so that this 'optimum' point may be discovered. The costs and benefits of each are compared at the margin and net benefits are typically maximized at the point where marginal benefits equal marginal costs. For the proposed LAMW standard, the most obvious benefit is the volume of waste that would be permanently and safely disposed, while the most obvious costs are associated with implementation of the standard and public acceptance.

However, having made the point previously that the information was insufficient to do a proper CBA at the proposed level of the standard, it is obvious that a thorough options analysis is not really possible either. This then begs the question of how, under these circumstances, it can be demonstrated that net benefits are maximized for this rulemaking.

The answer comes in the form of constraints, both internal and external, to the latitude EPA/ORIA has in its rulemaking. Specific to this standard are several constraints that limit severely the number of options that can be considered.

Perhaps most important is groundwater policy. The Agency adheres to a groundwater policy that strives to limit pollution to an aquifer, which is or may serve as a source of drinking water, to levels consistent with the Safe Drinking Water Act (12). This a limit for a specific pathway to protect a specific resource and would be applied in addition to a limit on an all-pathways dose or risk. It may thus be more constraining than an all-pathways limit involving radionuclides.

At the same time, given that EPA will be looking to NRC to implement its standard and assuming that NRC would have to issue a license, the EPA must insure ease of NRC licensing. It is understandably very difficult for EPA to predict which aspects of its existing licensing requirements NRC will feel it necessary to apply to LAMW disposal facilities. However, it is reasonable to conclude that the implementation process will become more complex (and therefore more expensive) as the allowable radionuclide content of the waste increases. To this end EPA is considering Class A restrictions as defined in 10CFR61 as part of its waste acceptance criteria.

Additionally, in deriving levels of protection for the standard, the EPA must take a number of other factors into account: consistency with prior Federal and other risk-management decisions related to radioactive waste management and disposal; supporting technical information; and risk levels applied under different statutory and regulatory actions. The Agency has considered in the past national and international radiation protection guidance developed by non-governmental bodies.

All of the above act to limit the latitude the Agency has in setting levels of protection for radioactive materials. Under these constraints, the difference in the options available for consideration may small and beyond our ability to discriminate, making an options analysis all but unnecessary

SUMMARY AND CONCLUSIONS

For EPA's soon to be proposed rule making for LAMW, a conventional cost-benefit analysis was not possible due to a lack of information on the wastes involved and the potential actions of implementing agencies and affected parties. However, the unusual characteristics of this rulemaking, i.e., that it is health effects neutral, creates no new requirements nor constraints that act to increase costs, is voluntary in nature and, where those who benefit monetarily, are also the ones who bear the costs, may render a CBA unnecessary as an indicator that benefits will exceed the cost of the standard.

Economic theory suggests that under these well defined and somewhat unique circumstances, rulemaking will produce either zero or positive net benefits. Given that this is a voluntary standard, unless potentially affected parties determine that the benefits of the rule making do exceed the costs, they will not take advantage of it. This worst case would produce a zero impact

and, just as importantly, it can be predicted not to have a negative impact, i.e., a net cost. This helps to justify the rule in the absence of a CBA. In this unusual case, the traditional "trade-off" cost-benefit comparison is not altogether necessary, and the cost-benefit analysis of the proposed rule is reduced to a consideration of the economic mechanisms that will determine the magnitude of the cost savings and risk reduction that are attributable to this rulemaking. This paper concludes that under these specific circumstances, a rigorous CBA under the terms of E.O. 12866, while still of value, is not necessary to prove that a rule making may provide a net benefit to society and it will most certainly not have a net cost.

The approach EPA is taking to rulemaking with this standard is believed to provide commercial RCRA-C operators and waste generators a more flexible and cost-effective method to dispose of specific types of wastes, given the current status of Federal and State regulations. In the absence of this action, waste disposal costs for small volume generators are expected to remain high, since they would be required to dispose of low activity waste in facilities designed to receive more hazardous waste or store waste for indefinite time periods at the point of generation. This approach is also believed to free up disposal capacity at facilities specifically designed to receive more hazardous low-level and mixed waste, while allowing the disposal of LAMW in alternate, but protective facilities. Accordingly, the proposed standard is expected to provide an effective disposal method commensurate with the radiological and hazardous properties of LAMW. In turn, these considerations should encourage waste generators to dispose of such wastes, rather than storing them. In the long term, this approach is believed to be generally safer for workers and the public, as it appropriately places such wastes into a small number of facilities designed for disposal, as opposed to storage in numerous facilities not necessarily designed to offer long-term containment and protection.

EPA recognizes that commercial RCRA-C facility operators and waste generators will apply the proposed rule only in specific instances by balancing the implementation requirements embodied in the standard against economic and practical considerations. Without an appropriate standard, waste-disposal management costs are expected to be higher as it would require the storage of such wastes for indefinite times in facilities that do not offer the best level of protection to the public and environment. The standard is expected to provide the means to readily dispose of a fraction of the mixed waste volume that is currently being held in storage throughout the nation. As a result, it is expected that such waste will be rendered less hazardous through treatment and placement in facilities designed to ensure the protection of the public and environment for the long-term.

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