FRAMEWORK FOR EVALUATING THE UTILITY OF INCENTIVE SYSTEMS FOR RADIOACTIVE WASTE REPOSITORY SITING[a]

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The importance of social and institutional issues in siting radioactive waste management repositories has been recognized in recent years. Within this set of issues, the siting of radioactive waste repositories over the objections of members of potential host communities is viewed as especially problematic. A number of recent studies and some policy initiatives have suggested the use of numerous incentives to potential host communities to increase local support and offset local opposition. These incentives have included, among others, private insurance,[1] rebates on electric utility costs,[2] payments-in-lieu-of-taxes,[3] and a variety of waste management program guarantees designed to respond to the concerns of state and local governments.[4] Rarely, however, have incentives been systematically identified, investigated or evaluated. This study, based upon a review of recent experiences in the siting of radioactive and chemical wastes, proposes a framework for evaluating the potential utility of incentives in nuclear waste siting. Corroboration or refutation of this framework and of the utility of incentives themselves can only be achieved through an examination of case studies where incentives were or are being implemented.

Most previous studies of and proposed solutions to the social and institutional problems of radioactive waste repository siting have stressed federal/state relationships and have largely excluded both the concerns and role of potential host communities. These strategies (including Federal preemption,[4] siting on Federal reservations,[5,6] state veto,[7] the siting jury,[8] the paths of least resistance strategy,[7] and the consultation and concurrence principle)[5] ignore or at best minimize the importance of local concerns. Given the significance of local community acceptance of a

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[a]Research sponsored by the Office of Nuclear Waste Isolation, Battelle, Columbus, Ohio and the U. S. Department of Energy, under Contract W-7405-eng-26 with the Union Carbide Corporation.

repository, it is important that facility-related impacts be considered and assessed, and that these interested parties be included in the considerations, assessments and deliberations. Incentives responsive to the concerns of local communities may facilitate community acceptance if certain criteria are satisfied.

INCENTIVES FOR WHAT? A CLASSIFICATION SCHEME

Prior to enumerating criteria for evaluating the potential utility of incentives for radioactive waste repository siting it is important to define carefully what is meant by the term "incentive." Previous discussions have assumed that various incentives would help in the siting process without specifying how they would accomplish this goal. We have classified incentives into three functionally different categories. Incentives may: (1) mitigate potential risks or adverse impacts that could occur during construction and normal operation of the facility; (2) compensate individuals for actual damages in the event of an emergency, accident or other unforeseen anomaly; or (3) reward the host community for assuming the costs and risks associated with resolving a non-local problem.

INCENTIVES: SOME EMPIRICAL DATA

Limited evidence supporting the potential utility of mitigation, compensation and reward in resolving radioactive waste repository siting difficulties is derived from a 1980 survey of 420 rural Wisconsin residents.[9] When people were initially asked about their attitudes towards a waste facility a substantial majority (71 percent) opposed locating one in their community, while only 22 percent favored such a decision. Significant elements of the same sample population shifted their attitudes when asked whether they would favor a facility in their community if induced with a limited set of incentives; opposition decreased to 47 percent of those surveyed, while support increased to 42 percent.

Despite limits in the data,[9] findings suggest that non-monetary incentives, such as indepedent monitoring and access to information, may significantly add to public acceptance of radioactive waste repositories. Moreover, results help confirm that packages of incentives may be of greater utility than single incentives. Finally, whereas a 20 percentage point shift in the acceptability of a repository appears to be significant, in a

real-world application of a potentially broader range of incentives this shift might be much less or much greater.

A FRAMEWORK FOR EVALUATING INCENTIVES

The different types of incentives previously identified and classified are mechanisms that may aid in securing local agreement to host a radioactive waste repository by addressing or ameliorating both real and perceived costs to the host community. This section offers four sets of criteria which may be used to evaluate the advantages and disadvantages of particular incentive mechanisms. A simplified view of our evaluative framework, with the criteria appropriately grouped, is shown in Fig. 1.

What Is Absolutely Necessary? The use of incentives in siting noxious facilities is not a panacea for the current siting difficulties but is instead suggested as a potentially attractive mechanism requiring careful judgements and fine tuning to local circumstances. In the present atmosphere of suspicion, fear and distrust of regulatory agencies and facility developers,[10] casual attempts to offer incentives can result in public misunderstanding of their intended purpose and prompt rejection as bribes, unethical tradeoffs or unwelcome strategic ploys. The present conditions of distrust among the public must be overcome before successful and politically viable sitings can occur.

Preconditions identified for the introduction and use of incentives include: (1) safeguards for health and safety; (2) control-authority arrangements; and (3) negotiations among affected parties. All of these are requirements concerning the setting, existing arrangements and the context within which trust can be developed, costs can be identified and evaluated by local interests, incentives can be identified, and bargaining can be conducted.

(1) The adequacy and reliability of existing safeguards for both health and safety are salient issues for the agenda of any siting exercise. Extensive discussion, demonstration and assurances by trusted and authoritative persons (groups, agencies) are warranted. Through such an interactive process of raising questions and concerns, reviewing and evaluating information, and comparing and testing assurances of safety, the community may proceed to determine what level of safety would be acceptable to them under what conditions. Additional guarantees, over and above

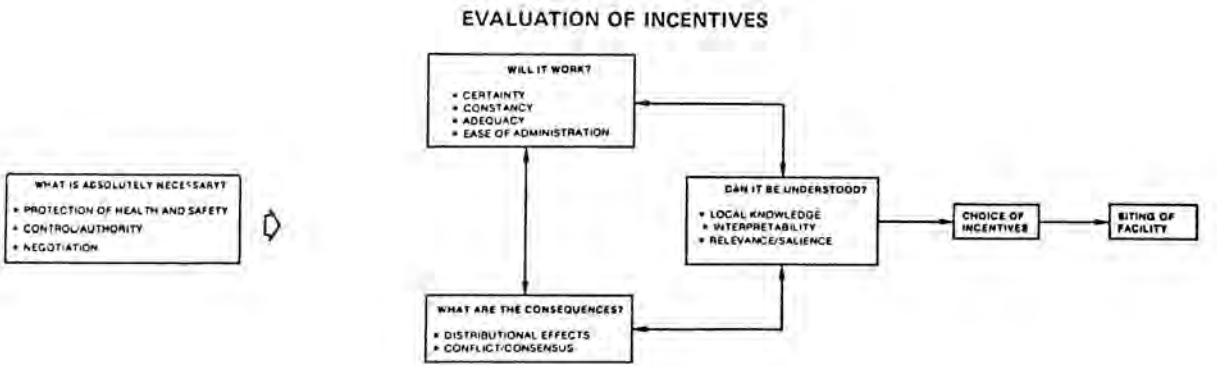

Fig. 1 - A framework for evaluating the utility of incentives

those mandated by Federal or state law, may be a reasonable subject for later negotiation if the need for such is identified by local interests during their examination of existing levels of protection.

(2) A local role in developing and implementing siting arrangements is another precondition for the use of incentives. Determinations of the appropriate roles of local communities and their citizens, the state, facility operators, the Department of Energy, and facility users (utilities) in developing and implementing an incentive system are crucial.

Between the approaches of Federal preemption and state or local veto are a range of compromise approaches in which the different levels of government share power. Though the terms consultation and concurrence and cooperative federalism have been widely used in the waste program in describing Federal/state relations,[11] the shared powers approach as put forth by Kevin, modified to include an equal role for potential host communities, appears to best describe the balancing of interest among all relevant governmental units.[4] The basic features of Kevin's shared powers systems are: (1) the provision of forums for exchanging information and grievances; and (2) a checks-and-balances system allowing the state and/or community under some circumstances to halt some Federal siting activities and Federal power to override state and/or local objections given certain conditions.

(3) Negotiation may be a key ingredient for a successful facility siting process. Though time-consuming, negotiation can help balance and resolve competing interests. It is the only major public participation strategy which focuses on reconciliation of differences and thus has the building of consensus as a possible outcome.[12]

Most radioactive waste negotiations have thus far been conducted only between Federal and state jurisdictions. There are, however, an increasing number of examples of negotiation processes (including some involving incentives) which specifically incorporate local participation to be found in the analogous and still evolving field of hazardous waste management.[13] The Massachusetts Hazardous Waste Facility Siting Act (1980) is the best example of a state law that employs an incentive-based, site-specific negotiation approach overseen by a council representing state and local concerns.[14]

Congressional action may be necessary to legitimize any agreements made by DOE with state and local governments. Without this legitimacy, the credibility of DOE agreements would not likely be sufficient to convince local governments to accept the facility. Even if Congress were to legitimize agreements between DOE and local governments, communities may still be hesitant to accept the facility due to perceived instability or inconstancy of Federal decisions, whether made by the legislative or executive branch.

Will It Work? There are a number of objective features of an incentive that are relevant to the social and institutional dimensions of radioactive waste repository siting. These include certainty, constancy, adequacy and ease of administration. Each of these features would likely be assessed independently by potential host communities and their citizens in the process of identifying and negotiating an incentive system. Given inter- and intra- community variation in assessing the appropriate values for these criteria, it is impossible to specify particular values that would lead to siting successes. Attention to these criteria, however, would likely lead to an earlier agreement regarding siting and incentives among affected interests than would otherwise be the case.

(1) Certainty refers to the likelihood that an incentive will be received or delivered as agreed. The confidence of the community that it will receive the incentive and, more generally, its confidence in the credibility of the sponsor's overall plan will be significant issues in the siting process. The degree to which incentives are perceived as empty promises will affect the level of local opposition to the incentive approach.

In general, perceptions of the sponsoring agency's credibility are closely related to the agency's expertise and trustworthiness.[15] Public opinion of Federal competence and responsiveness in the management of radioactive waste is low due to a variety of factors.[4,16]

These same factors are implicit in dealing with incentives. Delay in formulating and enacting a specific radioactive waste management plan and in demonstrating competence and reliability in safety and financial arrangements to Federal/state/local governments adds to the uncertainty of the outcome. Several states have specified such guarantees in legislation dealing with the

related problem of hazardous waste management; included among these are Massachusetts, Michigan, Ohio, Pennsylvania, and Tennessee.[14]

(2) The constancy criterion attempts to measure the steadiness of the incentive over time. For example, an incentive such as a job training program could be continuous over the facility life-time. A block grant, however, may be a one-shot affair. In between but falling toward the continuous end of the scale are yearly impact-mitigation payments to the community which may be derived from user fees.

Constancy will be important in resolving the temporal equity concerns in radioactive waste storage and disposal. Incentives which are continuous will provide a stream of benefits to the community over time. Singular schemes will favor the population present when the incentive is received. Since each extreme has positive and negative aspects it cannot be stated which is preferable.

(3) Adequacy refers to the degree to which an incentive is sufficiently large or complete enough to make repository siting acceptable to a community. In view of the functions incentives are desigend to fulfill, adequacy may have a number of different meanings: Is the potential compensation high enough? Is the level of safety provided by the mitigation "safe enough"? Are all likely risks addressed? Does the type of incentive chosen match the perceived need?

The adequacy of the incentives and other siting arrangements is probably the key determinant of siting success from the local perspective. The process by which this determination is made therefore becomes a critical component, and involves the preconditions for siting-control-authority, guarantees of health and safety, and negotiations. People's perceptions of adequacy are highly variable, rendering a priori measurement of the degree of consensus about adequacy impossible.

(4) Ease of administration exhibits a number of dimensions. Are procedures and institutions that are necessary to administer the incentive in place or do they have to be designed and developed prior to implementation of the incentive?[17] Is the incentive system so complex that additional interacting layers of bureaucracy are required for administration? Does the incentive system incorporate an appellate or renegotiation procedure which

is burdensome, complex and time consuming?[3] Are the administrative costs of implementing the incentive system disproportionately large?[3]

Each of these dimensions can significantly alter the ease and costs of incentive administration. A simple, inexpensive administrative system would be preferred unless it negatively affects the satisfaction of other important criteria.

Can It Be Understood? A comprehensive evaluation of the utility of any incentive system requires an assessment of the degree to which the proposed incentive fulfills its role of easing public opposition. How the incentive system is translated by the community is another fundamental determinant of whether the incentive will actually succeed in overcoming community opposition. Are community residents aware of the incentive, do they understand it, and do they feel it is relevant to their concerns?

(1) A necessary first step is to determine the extent to which the community is aware of the existence of an incentive. Knowledge of the facility itself may tend to overshadow awareness of a proposed incentive, or any influence the incentive may have in shaping public support for or opposition to the facility. In general, if the local public is unaware of the incentive, it can have little influence in modifying public support or opposition.

(2) Once the extent of local awareness has been established, the next question is how well the local community understands what is being offered. This understanding is related to both the structure and function of the incentive system.

An understanding of the structure refers to the ability of the community to define how the incentive will be implemented and will operate. This, in turn, requires the community to interpret many of the parameters of the incentive, such as certainty, constancy, and adequacy. How these parameters are interpreted will be based, in part, on the community's awareness of the siting process, past experience, and media coverage.

Interpretation by the community of the function to be served by the incentive is not always straightforward. Some groups within the community may be unable or unwilling to distinguish between the purposes of various legitimate incentives and a bribe. It may be, however, that this response may be less a reaction to what is being proposed, than to how it is proposed. For example, an incentive may be more likely to be interpreted as a bribe when

the proposal is initiated by the facility sponsor than when developed as a reaction to a community's request.[18] Until incentive systems become a much more common and accepted siting mechanism, this response is likely to remain fairly typical.

(3) After the extent of community awareness and the level of understanding of the purpose and operation of the incentive have been determined, the next question is: "Is the incentive perceived to be relevant and appropriate?" In other words, to what degree is the incentive perceived to address the risks and impacts believed by the community residents to be associated with the facility? This assessment is critical in determining community acceptance of the incentive. If an incentive is viewed as correcting problems associated with a facility, the incentive may be more favorably received by the public.

What Are the Consequences? The consequences of implementing an incentive can be analyzed by assessing its distributional effects and its ability to effect community conflict or consensus. These effects are partially a function of the other incentive criteria (i.e., preconditions, an incentive's objective features, and community understanding of the incentive) and partially a function of the community's existing demographic, cultural, normative, social, political and economic structure. Since much information in these areas has already been presented, the following will seek to summarize the major points of discussion.

(1) Distribution refers to how the benefits, risks, and costs of a waste facility are received or borne by different individuals and/or groups in the community and beyond. In simple terms, who benefits, who pays, and how do these effects accrue over time? Though the definition of fair distribution differs from person to person, it is generally agreed that beneficiaries of actions should pay the accompanying costs to the extent possible. The beneficiaries of the activities which have generated high-level commercial radioactive waste can be considered to be national, because of nuclear power's contribution to energy independence. A narrower view claims a smaller class of beneficiaries-consumers of electricity generated by nuclear power. The distributional effects of alternative incentive schemes (i.e., mitigation, compensation, and reward) are likely to vary.

(2) It can be expected that the siting of any noxious facility, such as a radioactive waste repository, will generate local conflict and opposition.[19,20] Presumably, incentives may help to

diffuse some of that opposition, to develop a local consensus supporting the siting and operation of the facility, and to maintain that consensus within the host community for a long period of time.

Some incentive systems, however, may themselves generate additional conflict and opposition within the potential host community (i.e., conflict over and above that generated by the siting of the facility acting alone). Although it may be difficult to distinguish between these "causes" of conflict empirically, particularly because of their potential interrelatedness, it is essential to distinguish between them conceptually.

To the extent that the two interventions (i.e., facility and incentive) are perceived by community members as a single package or bundle of outcomes, conflict or opposition to the incentive would be expected to "spill over" and affect the siting decision. Conflict generated by the incentive may polarize the community and jeopardize the integration of the facility and its operators into the community if the facility is indeed sited there. If local community residents perceive that the incentive is offered as a means of diverting their concern and attention away from facility impacts, the incentive may exacerbate local opposition to the facility. This perception would likely undermine whatever confidence local residents and officials have regarding reliability and intentions of the Federal government, the state government, the licensing and regulatory procedures - in short, their confidence and trust in external authorities and decision-makers.

The negotiations involved in a siting and an incentive design process can be a significant impetus toward the development of community consensus. What is critically important is creating the opportunity for all interested parties to be represented in negotiations. In this way divergent attitudes and reasons for those attitudes can be discovered, and the community can determine what package of benefits, if any, would be necessary to develop consensus. Negotiations will not automatically produce consensus, but they are likely to increase substantially the possibility of consensus. Since the stated purpose of incentives in radioactive waste repository siting is to achieve a balancing of real and perceived local burdens and benefits to encourage local acceptance of the facility, it may seem anomalous that incentives can themselves have adverse consequences. Such a possibility is very real, and

we cannot be sure that we have identified all such consequences. What can policymakers do to minimize the likelihood of such occurences?

Awareness of such a possibility is the first step. One can also systematically evaluate the causes of such outcomes and design a siting process which is sensitive to these phenomena. These activities can be approached in a variety of ways, but because of the centrality of local community acceptance of the repository, it is important that siting and incentives be assessed in a community context.

CONCLUSIONS

The classification scheme, framework, and criteria identified in this study, though based on a comprehensive review of relevant literature, were developed to a large extent inductively. Actual experience with incentives in the siting of potentially hazardous facilities, such as nuclear waste repositories, is limited if not almost nonexistent. The approach we propose has sufficient promise, however, to warrant further investigation and analysis.

It may be advantageous to the Federal government to encourage community self-examination of the risks, costs and benefits of repositories and associated incentives. These independent reviews and assessments have been suggested by various interests[13,21] and potential models are available.[14,22] Experimentation with community participation in repository siting and incentive design and implementation processes would not only help to corroborate or reject the analyses offered here, but would also allow for one of the most relevant ways in which to evaluate costs, risks, and benefits in a real-world setting.

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