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INCENTIVES AND THE SITING OF RADIOACTIVE WASTE FACILITIES

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ABSTRACT

The importance of social and institutional issues in the siting of nuclear waste facilities has been recognized in recent years. Limited evidence from a survey of rural Wisconsin residents in 1980 indicates that incentives may help achieve the twin goals of increasing local support and decreasing local opposition to hosting nuclear waste facilities. Incentives are classified according to functional categories (i.e., mitigation, compensation, and reward) and the conditions which may be prerequisites to the use of incentives are outlined (i.e., guarantee of public health and safety, some measure of local control, and a legitimation of negotiations during siting). Criteria for evaluating the utility of incentives in nuclear waste repository siting are developed. Incentive packages may be more useful than single incentives, and non-monetary incentives, such as independent monitoring and access to credible information, may be as important in eliciting support as monetary incentives. Without careful attention to prerequisites in the siting process it is not likely that incentives will facilitate the siting process.

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1.0 EXECUTIVE SUMMARY

In recent years, the importance of social and institutional issues in the siting of radioactive waste management repositories has been recognized. The National Waste Terminal Storage Program has included in its socioeconomic program during the past year the development of evaluated incentive arrangements for possible inclusion in the consultation and concurrence and other siting mechanisms under review by the Program. This task addresses why incentives might be used, what incentives are, how we know what incentives to use, and whether incentives work.

The nearly universal reluctance of states and communities to host radioactive waste repositories suggests that significant costs and risks have apparently been overlooked when government agencies and nuclear industry representatives have made overtures to potential host areas. A number of recent studies and policy initiatives have suggested that diverse incentives be used to address these costs and risks in order to increase local support and offset local opposition to repositories in potential host communities. Incentives are judged to be preferable to disincentives (e.g., federal or state preemption) since incentives may generate support while disincentives do not eliminate opposition.

Limited survey data and other studies indicate that incentives may encourage people to change their positions on radioactive waste repositories. In an overall siting strategy, incentives are but one part of a structured process involving the creation of a mutually acceptable set

of arrangements which make certain guarantees and confer certain benefits in exchange for the acceptance of the proposed facility. Since the needs to be fulfilled are varied, a package of incentives is likely to be more acceptable than any one single incentive.

Previous discussions have indicated that various incentives might help in the siting process without specifying how they would accomplish this goal. We have classified incentives into three functionally different categories and have specified a number of criteria which might be used in evaluating the utility of incentives in radioactive waste repository siting. It is important to differentiate among incentive types in order to determine / and to whom an incentive might be offered and what institutional and administrative arrangement might be necessary to implement the incentives. 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. The report categorizes several current and potential incentives according to this classification scheme.

This study provides the initial step through which incentives might be identified, assessed, negotiated, and implemented by affected parties. It is suggested that selection of incentives can best be achieved by evaluation according to criteria responsive to four broad questions (Fig. 1):

EVALUATION OF INCENTIVES

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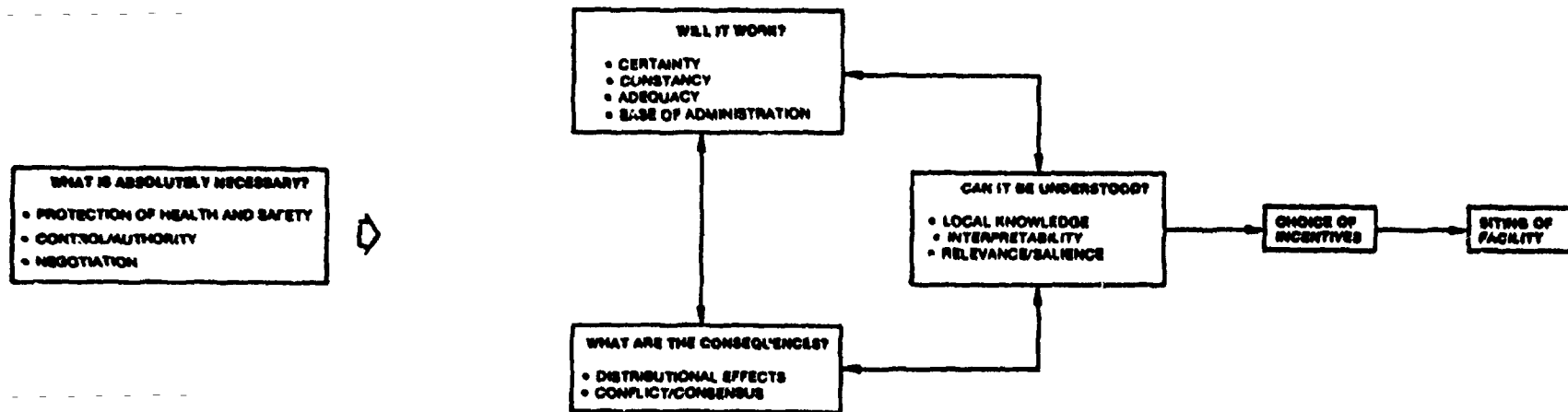


Fig. 1 - A framework for evaluating the utility of incentives

(1) What is absolutely necessary? Certain preconditions are required before the use of incentives can be successful: (a) trust in siting participants and institutions must be established; (b) a minimum package of health and safety protection must be guaranteed; and (c) some local control and ability to negotiate conditions must be central to the siting process. A major current obstacle to the use of incentives is the absence of public understanding about incentives or the institutions to negotiate and implement their use. These preconditions are necessary to clarify the incentives' legitimate purpose of providing benefits to local affected parties where none exist, and to differentiate them from illegitimate use of money and influence, as in bribes. Local interests can also misuse the incentives approach and they, as well, should exercise their rights fairly and to mutual benefit.

(2) Will incentives work? 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 certainty, constancy, and adequacy of the incentive are community-dependent and must be addressed in that context. In addition, the process of administering the incentive must be carefully constructed and carried out.

(3) Can the incentive be understood by residents of the potential host community? How the incentive is perceived by local community members is crucial to its effectiveness in resolving cost/benefit imbalances and in overcoming community opposition. Community residents must be

aware of the incentive; they must understand its actual goals, the true purpose for which it is proposed, and how it will be administered; and they must comprehend its relevance to their concerns regarding siting.

(4) What are the consequences of the incentive? Siting of any waste and/or nuclear facility is almost certain to generate some local conflict and opposition and have differential impacts on various segments of the community. Such a facility handles hazardous materials; its security must be maintained over long time periods; few sites have appropriate geologic formations; and the Federal government will likely own the facility. Each characteristic leads to particular costs and lessens the likelihood of normal benefits. The benefits, risks, and costs are received or borne by different individuals and/or groups in the community and beyond; who benefits, who pays, and how these effects accrue over time are key distributional questions.

Local consensus (usually defined as gaining the support of two-thirds to three-fourths of a given population) is preferred over the support of a simple majority in order to minimize the possibility of losing so much support over time that the initial siting decision would be reversed. In a policy arena such as radioactive waste repository siting where a reversal could have significant adverse impacts (e.g., litigation, if not outright closure and decommissioning), it is important that a substantial consensus supporting the facility be achieved. Critical to developing consensus 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 would be necessary to develop consensus. Negotiations do not automatically produce consensus and good distributional arrangements, but they are likely to increase substantially the likelihood of reaching that goal.

It is not possible to know a priori whether incentives represent a solution to the social and institutional problems associated with radioactive waste repository siting. There is some limited evidence, however, that incentives may be an appropriate research and policy direction. In a survey of three Wisconsin communities in 1980 (426 respondents) it was discovered that offering a range of incentives increased support for siting a repository locally from a 22% to 42% and decreased opposition from 71% to 47%.* The greater decrease in opposition in contrast to the increase in support is explained by the number of respondents who changed from being opposed to being unsure.

Men were significantly more likely to change their minds in favor of siting a waste facility in their community when offered incentives than were women (Table 1). Although not statistically significant, there was a tendency for those with higher family incomes to respond favorably to siting a repository in their community when offered incentives than for those with lower incomes.

*This poll was directed at ascertaining the feelings of local residents about siting of nuclear waste repositories. The poll was conducted in 1980 by John Kelly, Complex Systems Group, University of New Hampshire. Comparisons with other surveys on nuclear power suggest that these response patterns are fairly typical.

The experiences and setting of the community also influenced how people responded to incentives. Significantly greater numbers of people living in a community which has a nuclear power plant but no perceived potential as a waste site changed their minds than did people in communities which had no existing nuclear plants but which were being considered as possible sites for a waste repository. On the surface, the amount of public debate over a repository in potential host communities did not seem to influence the efficacy of incentives.

There was also substantial variation in the packages of incentives which induced people to change their positions. Payments combined with access to information constituted the most frequently chosen package. Significant percentages of the respondents needed, in addition, independent monitoring and the power to shut down the facility to induce them to change their mind (Table 2).

Obviously this limited analysis does not provide a definitive answer about incentives nor is the sample adequate for such an analysis. Even so, it does suggest several things. First, incentives can encourage people to change their positions about siting waste repositories. Secondly, the data suggest that there are non-economic incentives (e.g., independent monitoring and access to information) that may contribute significantly to public acceptance of a radioactive waste repository in a local community. Thirdly, the data suggest that packages of incentives rather than single incentives may be required to gain

acceptance. Finally, this very limited exploratory approach suggests that survey methodology can be used to explore people's responses to incentives. Such analyses need to be pursued.

Most previous studies have stressed Federal/state relationships in repository siting, excluding the concerns and roles of potential host communities. Given the centrality of local community acceptance of a repository, it is important that potential incentives be assessed in a community context. Our research framework, though developed from a comprehensive review of relevant literature, is primarily inductive; potential host communities must evaluate its true utility. Local governments and, in turn, the members of potential host communities should be included in Federal/state discussions and institutional arrangements.

Research should continue on validating the preliminary criteria identified and listed in Fig. 1, using existing data sets and testing the framework against current experience where possible. The incentive design process will be developed, including the selection of some incentive options and characterization of those incentives in terms of the criteria given here. This research will be guided by and integrated with the current plans for siting exploratory shafts and a test evaluation facility.

Table 1 - Favorability (for respondents initially opposed to a waste site) to siting a nuclear waste facility in the respondent's community after exposure to incentives (in percentages)

	Remained unfavorable	Became favorable	Number of people initially opposed to a waste site
Sex			
Male	59%	41	80
Female	77	23	189
Family income			
Under \$5,000	77%	23	31
\$5,000 - 9,999	70	30	33
\$10,000 - 14,999	73	27	63
\$15,000 - 19,999	65	35	49
\$20,000 - 29,999	68	32	50
\$30,00+	54	42	24
Type of community			
Nuclear host community with no perceived waste site potential	59%	41%	121
Potential waste site where there has been little or no discussion of possible siting	81	19	63
Potential waste site where there has been public discussion of possible siting	79	21	90

Table 2 - Distribution of persons who changed their position to accept a waste repository in their community by type of incentive package^a

Incentive	Cumulative percentage
Substantial payments to your community	23
Access to information	48
Independent monitoring	65
Representation on a governing board [of the facility]	74
The power to shut it down	93
Other	99
TOTAL	77 persons

^aIncentives were offered additively. That is, people were asked if substantial payments to the community would be sufficient to accept a repository. If they replied in the negative, they were then asked if payments and information would be sufficient. The interviewer continued down the list until there was an affirmative response or the list was exhausted.

2.0 - SOCIAL AND INSTITUTIONAL DIMENSIONS OF RADIOACTIVE WASTE MANAGEMENT POLICY

The future of nuclear power as an energy supply option in the United States is predicated in large part upon resolution of serious problems related to the storage and disposal of waste products. Evidence from at least one poll in Wisconsin suggests that solution of the waste problem would increase support for the construction of nuclear power plants by 15% (to around 60% support) and perhaps by as much as 25% (to about 70%).

In recent years, the importance of social and institutional issues in siting radioactive waste management repositories has been recognized. Within this subset of issues, the siting of radioactive waste repositories over the objections of members of potential host communities is viewed as especially problematic. The extent of the problem is illustrated by the Wisconsin community survey, which reported that two-thirds of the respondents were strongly opposed to siting a repository in their community while just 5% strongly favored a waste repository.

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, but many have been designed to fulfill generally unspecified functions. These incentives have included, among others, private insurance (Goetze, 1981), rebates on electric utility costs (Starr, 1980), payments-in-lieu of taxes (Bjornstad and Goss, 1981), and variety of waste management program guarantees designed to respond to the concerns of state and local

governments (Kevin, 1980). Rarely, however, have incentives been systematically identified, investigated or evaluated.

The range of social and institutional issues which currently plague governmental attempts to resolve the radioactive waste management problem is extensive. Kasperon (1980) has clustered them into institutional uncertainties, public acceptance, and equity issues. Institutional uncertainties include institutional fragmentation, gaps in regulatory authority, waste management program inconsistencies, inter-governmental conflict, and a diminution of institutional credibility (see also, Abrams and Primack, 1980). The lack of institutional credibility was evidenced in the previously cited survey data where utilities, state government, and the federal government (institutions which have traditionally been sources of much of the information about nuclear power) were not perceived to be reliable sources of information about nuclear waste; only 6 to 9% of the respondents believed any of these institutions to be the most reliable information source.

To this list of institutional uncertainties, Kevin (1980) has added systemic and idiosyncratic characteristics - emerging trends in federalism (e.g., the "Sagebrush Rebellion"); perceptions of incompetent institutional performance on non-waste management issues (e.g, virtually all institutions after the Three Mile Island accident); and increasing awareness of serious deficiencies in non-radioactive hazardous waste management (e.g., Love Canal; West Tennessee; see also Carnes, 1981).

Public acceptance within potential host communities is highly questionable, given these social and institutional difficulties. Yet, public acceptance of such a facility is necessary in order to site, construct, and operate the facility for extremely long periods of time. As is the case in siting all types of facilities, health and safety must be the primary considerations, followed by facility related economic, environmental, and socio-cultural issues. If people fear hazardous waste to the extent that they believe it represents a real risk to their health and well being, a disposal facility is unlikely to be sited through any mechanism (Bacow, 1980). Public perception, education and involvement in the siting process are critical. The major question facing facility sponsors can be reduced to how to develop and maintain local constituencies in host communities for the repositories.

Equity issues center about problems of spatial equity, inter-generational equity, and what Kasperson has characterized as the labor/laity equity problem (i.e., impacts on waste management workers versus the general public). Local citizens feel strongly that those who generate radioactive waste should be responsible for it. In the Wisconsin survey, nearly 70% of the sample said that a waste repository in Wisconsin should be for wastes generated only in Wisconsin. Less than 7% were willing to accept wastes from the region (Midwest), and only 5% were willing to accept wastes from anywhere in the United States. These general trends are borne out in other studies (Kevin, 1960).

All of these issues have combined to create a stalemate, both in terms of making national policy on siting and in terms of how a national

siting policy might be implemented at the state and local level. The stalemate can be broadly attributed to a lack of public acceptance of proposed radioactive waste management repositories, together with general uncertainty about the acceptability of nuclear energy (including wastes).

2.1 The Local Dilemma

The United States has already generated considerable quantities of radioactive waste. Even if a decision were made immediately to halt all future radioactive waste generating activities, the current accumulation still requires safe and secure storage and disposal. It is thus unavoidable, given the current dominance of land-based disposal technologies, that certain communities and their citizens will eventually host radioactive waste repositories. These communities could be those adjacent to currently operating reactors (at-reactor storage), existing Federal and commercial waste repositories, or sites to be identified in the course of implementing a national radioactive waste management plan.

The object of this study is to consider incentives as a mechanism for resolving conflicts arising from the siting of radioactive waste repositories. The purpose of incentives is to offset real or perceived adverse impacts associated with siting, construction, and operation of a radioactive waste repository in order to make the facility acceptable to a potential host community and its residents. Those adverse impacts include the conventional public and private sector impacts associated with any large construction project (Purdy, et al, 1977), but they also include perhaps less tangible yet equally important actual and perceived

risks to public health, safety and the environment. Incentives may be thought of as fulfilling different functions: mitigation, compensation, or reward (see Sect. 3).

2.2 Incentives and Disincentives

The literature on policy analysis is replete with investigations of how to compel or induce individuals, firms and subordinate levels of government to comply with government policy. This literature is generally broken down into two approaches -- carrots and sticks. Taking the latter approach first, one can compel obedience through implementing penalties or disincentives for non-compliance. In the case of siting radioactive waste repositories, this approach could entail a variety of activities, but the most commonly proposed are federal or state preemption with the accompanying powers of eminent domain and condemnation. These strategies would remove the capability of local governments and their citizens to halt siting by removing local authority to issue necessary permits and approvals and giving that power only to the Federal or state government. Bacow (1980) has identified a number of reasons why preemption in particular and disincentives in general are not likely to be entirely successful in siting hazardous waste disposal facilities.

Incentives, on the other hand, offer more positive inducements to communities to accept radioactive waste repositories. They are offered as one means of resolving conflicts which may arise during facility siting. The incentive system includes, therefore, not only transfer

payments, but also, and perhaps more important, the procedures which might be employed by affected interest in identifying, assessing, negotiating, and implementing an incentive(s).

Concerns over the intentions of various levels of government (i.e., Federal, state, tribal and local) and interests (e.g., utilities, environmental interest groups, etc.) involved in waste facility siting have led to precipitous action by each group, in attempts to protect the perceived "best interests" of each. There are fears that the Federal government will site waste facilities over legitimate state and local concerns, that many states will refuse to site waste facilities under any circumstances, that if Federal/state negotiations succeed, the benefits of siting the waste facility might accrue mainly to state interests - ignoring local needs and concerns, and that special interest will dominate the policymaking process to the detriment of national interests. Establishing a workable and equitable plan for dealing with conflicting views requires an understanding by all affected parties. This includes achieving a consensus over the nature of these concerns, the mechanisms that might be used to alleviate them, and when and how to apply them.

2.3 Costs and Benefits of Repositories

The nearly universal reluctance of states and localities to host nuclear waste repositories suggests that significant costs and risks have apparently been overlooked when agencies of government and representatives of the nuclear industries have made overtures toward potential host areas. This section presents a taxonomy of these costs and

risks which host areas may perceive that result from the siting and operation of a waste facility and identifies the general lack of conventional benefits associated with such activity.

Most communities are willing to accept and many actively seek new economic activities, anticipating that the benefits from new jobs, additional tax dollars, and the general vitality associated with new enterprise will outweigh the associated social, economic, political, health and environmental costs or adverse impacts. When communities reject such activities, they do so because they perceive a benefit-cost-risk imbalance. When costs and risks go uncompensated, communities will be reluctant to host facilities, and when they are exactly compensated, they view the facility with indifference. Only if they view benefits as outweighing costs and risks will they have an interest in hosting the facility (Bjornstad and Johnston, 1981). To the extent that communities have imperfect information and uncertainties exist regarding the benefits, costs and risks associated with new developments, communities may not make optimal decisions according to his idealized calculus.

Becker (1981) has examined differences between the perspectives of county governments and landfill operators on the large benefits and small costs of a particular site versus the lack of benefits seen by the host community population. Local reactions to existing defense facilities involving major radioactive waste handling and storage activities suggest the key role of the local benefit-cost balance. For instance, interviews in the impact area surrounding the Savannah River Plant in South Carolina revealed primarily favorable reactions in those

areas where substantial employment of local residents occurred, and significantly less favorable attitudes and more concern about health effects in one county with minimal employment or other benefits (U. S. Department of Energy, 1981).

The extraordinary nature of the waste repository requires dealing with benefits and costs at a level of detail exceeding that necessary for typical industrial enterprise. The differences that distinguish the waste facility are quite familiar. Among others, such a facility handles hazardous materials; its security must be maintained over long time periods; few sites have appropriate geologic formations; and the Federal Government will likely own the facility. Each characteristic leads to particular costs and lessens the likelihood of normal benefit structures.

2.3.1 Multiple costs

There are at least five types of costs associated with repositories. Only the first two are conventionally assessable as reimbursables, a circumstance that has led government and industry representatives to focus on these, while citizens in affected communities usually focus their attention on the latter three. First, there are infrastructure impacts - the stresses placed on community service delivery systems when development occurs. Second, there is chronic damage to physical systems, as would occur due to pollution under normal operating conditions of the facility. Third, there is accidental, perhaps catastrophic, damage to physical systems and the environment, as

would occur in the event of a large nuclear release. Fourth, there are opportunity costs - the unrealized benefits a community must forego to host a waste facility (e.g., the tax receipts from a privately owned industrial activity). Finally, there are extraordinary costs. These include costs due to such factors as risk, stigma, and uncertainty, among others.*

2.3.2 Lack of benefits

From the local perspective, the benefits of radioactive waste repositories are largely absent or difficult to identify except for the possibility of some employment. The jobs provided by construction and operation are the principal benefits, but many construction jobs (ranging from 1700 to 4200 depending on the geologic medium) will likely be filled by non-residents, and the number of permanent operating jobs ranges from 870-1100 (Office of Nuclear Waste Isolation, 1981). Only the largest facility in the most difficult (crystalline) geologic medium provides more than 900 permanent jobs. The taxes which accompany most private industrial facilities will not be paid if the Federal government is the owner;** the outcomes of efforts to tax federal contractors, as for example with Federal facilities in Oak Ridge, Tennessee, are as yet problematic and unresolved (See issues of The Oak Ridger after 1980 and particularly June 15, 1981). Furthermore, as

*For a different classification of costs, see Office of Nuclear Waste Isolation Community Development Handbook, 1981.

**Unless special arrangements are made, enabling legislation is passed, and financial authorizations are actually implemented through the budget process.

indicated in the discussion of costs, the presence of the federally owned facility may prevent or forestall receipt of other possible future benefits for the community by preventing different and more beneficial uses such as use of the land by tax-paying private industries.

The fact that sitings of hazardous/noxious waste facilities provide regional and national benefits is of little interest to local people for whom the costs loom large and the local benefits are virtually nonexistent. The National Governors Association policy statement on siting hazardous waste (1981) recognizes this frequent combination of a widespread dispersion of benefits and geographic concentration of costs. The local response invariably recognizes the need for such facilities but asserts that "somewhere else is better." This problem has been discussed by Peelle (1980):

Unlike the "tragedy of the commons" (Hardin, 1968) where people overuse or mis-use a public resource (public good) such as air or water, people commonly avoid their share of a public responsibility for siting noxious or undesirable facilities which fulfill essential public purposes. This results in the "inverse tragedy" of the commons, through aversion or shunning of responsibility for "public bads". Whereas everyone agrees that waste repositories must be sited somewhere, and we will benefit from the existence of properly managed facilities, the "not-here" response is well-nigh universal. Both tragedies occur because of the absence of institutional arrangements to regulate and limit use, and thus allocate risks and benefits in an equitable manner.

2.4 Incentive Types

It is very important to distinguish incentive systems according to their functions. Three types of incentives have been identified:*

*Bribery is a fourth category of incentives, but inasmuch as it is outside the law, it is not considered seriously as an option in this discussion. The possibility that the other types of incentives can be interpreted by the local community as a form of bribery is significant and is treated in various parts of this report.

- (1) mitigation against potential problems resulting from normal siting, construction, and operation of the facility;
- (2) compensation for real and perceived costs incurred in the event of an accident or anomaly; and
- (3) reward for the local community for assuming risks and costs in order to meet non-local (i.e., national, state, regional, international) need.

It is important to distinguish incentive types so that one can determine why a particular incentive might be offered, to whom it might be offered, and what institutional and administrative arrangements might be necessary to implement the incentive. This classification system should help the policymaker to recognize more exactly what types of costs and risks may require attention and policy initiatives. It also facilitates the development of evaluative criteria and an identification of which criteria are particularly relevant to which type of incentive.

2.5. Evaluation Framework

It is possible to identify a lengthy list of criteria which might be relevant to an evaluation of an incentive's utility. This preliminary study has identified twelve such criteria, which are clustered into four groups: (1) siting preconditions; (2) objective characteristics of the incentive; (3) characteristics of community understanding; and (4) the projected consequences of implementing a particular incentive. A framework for evaluating these clusters of criteria has been established to assist in identifying possible candidate incentives for further research and possible application and to indicate other avenues for research and alternative policy options (see Sect. 4).

This analysis carries with it a number of implications regarding its use. It is important that the reader understand the limitations of this analysis or, alternatively, the rules by which the elements of this study can be used. Diverse interactions among the criteria are identified, and their application within community settings is circumscribed.

2.5.1 Criteria interaction

The identification, assessment, negotiation, and implementation of an incentive in a local community are complex and dynamic processes. The criteria developed in this report are also complex and dynamic, and equally important, interactive. It is necessary, therefore, when evaluating an incentive to recognize that changes in the value of one criterion may affect other criteria and any overall composite score.

Space does not allow a complete description of interactive relations among criteria. However, several generalizations can be offered:

(1) Criteria are highly interactive. How a given incentive scores on any one criterion will likely be functionally related to how it scores on one or more of the other criteria.

(2) Because of the high degree of interaction, and inconstancy over time, criteria will not have static values for any incentive. Thus the process of utilizing criteria for evaluating incentives must be an ongoing and dynamic procedure.

(3) Individual criteria vary in their level of interrelatedness as well as in their strength in affecting other criteria. For example, one

criterion may be significantly influenced by other criteria (conversely, one criterion may frequently influence several other criteria).

(4) Many of the criteria are not truly independent of one another and may exhibit substantial multicollinearity. This implies that a significant dimension of one criterion may be a different criterion.

(5) Relationships among criteria are not necessarily two way or transitive.

It is possible that subsequent research might identify additional criteria, patterns or clusters of criteria and variables other than those identified in this framework, and might allow a ranking in terms of more and less powerful independent criteria and variables. Both of these steps, however, would require as prior steps substantial validation of the criteria themselves as well as tests for multicollinearity and other regression effects.

2.5.2 Intercommunity variation in incentive impacts

The preliminary criteria identified in Section 4 are general, not exhaustive, and do not address the question of how the impacts of incentives might vary by site-specific or community-specific characteristics. For example, variability among communities with respect to factors such as population size, cultural diversity, home-rule capabilities, geographic setting, and tax base would all likely intervene in determining the utility of a given incentive in a given community. These characteristics might be loosely identified as "host community structure" and could be incorporated as an additional variable of our framework.

2.5.3 Weighting of evaluative criteria

This analysis also does not address the variability of ranking or weighting of evaluative criteria by different communities and their citizens. To complicate matters even further, it must be recognized that citizens within communities or subgroups of citizens may rank the importance of criteria differently. One should be aware of the diversity of values possible within and among potential host communities, and that it has not been possible within this analysis to incorporate the potential effects of this diversity.

2.5.4 Other affected communities

This analysis fails to address the role of any communities or populations outside the one in which the repository is proposed to be sited. This is a serious deficiency which requires additional research, analysis and discussion. Defining the zone of influence of a repository is ultimately an ethical and political decision of considerable importance. It could certainly include populations proximate to the host community as well as those along the waste transport route.

3.0 - INCENTIVES FOR WHAT? A CLASSIFICATION SCHEME

Recent discussions of incentives for encouraging the acceptance of hazardous facilities have emphasized a fairly narrow approach by focusing on the use of direct payments. Incentives, however, should be viewed as a much broader range of actions that may promote acceptance. Non-monetary incentives may play an equally important role as economic ones in the siting process. Packages or mixes of incentives may be more attractive than the use of any single benefit mechanism. This section identifies and defines a variety of different types of incentives, overviews a range of options within each type, and provides examples and illustrations of how they might be utilized in siting radioactive waste facilities.

Three classes of incentives have been identified. Incentives can be developed to:

1. Mitigate potential problems.

A program could be established to mitigate adverse health, safety, environmental and socioeconomic impacts before they occur. The intent is to prevent accidents or other negative effects. This could entail establishing more stringent safety standards than those currently mandated on a state or national basis, or helping communities to prepare for any adverse impacts that might accompany the construction and operation of the facility.

2. Compensate in the event of an accident or anomaly.

A different approach could be established to compensate the community or members of the community for damages from any accident or

unanticipated anomalous event. Thus the incentive would be implemented only if costs or damages or actually experienced.

3. Reward the local community for assuming a non-local (i.e., national, state, regional, international) problem or risk.

Noxious facilities such as radioactive waste facilities usually serve a larger population and a different interest than the community in which they are sited. Thus a local population assumes risks from which other groups derive benefits. Incentives can be used to reward a community for the assumption of these non-local risks. These rewards differ from mitigation and compensation in that they go beyond what is required to offset adverse effects and maintain a status-quo. They are a means of making people who accept a national problem "better-off" than they were before the facility was sited.

Among these types of incentives, compensation and mitigation have become legitimate means to use in alleviating many of the direct, quantifiable impacts of facility siting. For example, Resolution 5-4 of the State Planning Council on Radioactive Waste Management (1981) reads:

The State Planning Council recommends that as the Federal government has the responsibility for developing repositories it should accept the responsibility for socioeconomic impacts resulting from such repository development. Impacts should be identified early in the repository development process, and be independently assessed by state/tribal/local governments with Federal funding assistance prior to a DOE application for a construction license. After the NRC decision to license repository construction has been made, Federal government impact payments should be made to states or tribes to distribute, in accordance with impact experienced, to affected jurisdictions.

However, the SPC "did not specify what types of impacts merit compensation but concluded that only quantifiable impacts should qualify, and not impacts caused by perceived risks of a high-level waste repository." (1981). This constraint may be extremely problematic because of large differentials between public and technical perceptions of risk associated with nuclear facilities and between perceived and quantifiable risk (Slovic et al., 1980).

The reward type of incentive has had a more limited application than mitigation or compensation but includes a broad range of options that have been applied by private and governmental entities in past siting practices. This incentive assumes a precondition that health, safety and personal rights of interested parties are protected. The interchangeable and currently casual use of these terms and concepts has tended to blur the distinctions between them, and the uninitiated tend to view all types of incentives as bribes.

Particularly difficult to distinguish is the difference between a reward and a bribe, which must be determined by the extent to which competing interests are served; if either party to the negotiation is unfairly treated in the process, the reward system deteriorates into bribery. Haymore (1981) argues that direct cash payments to offset adverse effects are a "legitimate trade" where a benefit is exchanged for bearing the burden of a facility. He contrasts this to a bribe or "secret contract with public officials to act against the public interest for personal gain."

The remainder of this section discusses each of the incentive types in some detail and identifies possible options within each incentive

type. These options are not meant to be exhaustive but merely to represent a variety of potential mechanisms to mitigate, compensate, or reward the local community for its involvement in the siting of a radioactive waste repository.

3.1 Mitigation

Mitigation is defined here in a slightly narrower framework than is generally the case. It only encompasses actions to alleviate the potential risks or anticipated negative impacts that could occur during normal construction and operation of the facility. Mitigation alone is not likely to neutralize local opposition to waste facility siting because it is not possible to eliminate all risks and local costs completely. It is, however, an important component of a comprehensive, multipurpose incentive package. Mitigation is largely based on the perceptions of the local population, and successful mitigation requires public involvement in determining the buffering, monitoring and other options needed and in administering these options (Bacow, 1980). Comprehensive planning by potential host communities is also necessary to enhance the potential of mitigation strategies. There are a variety of mitigation measures and mechanisms.

3.1.1 Buffers/land use management.

Money could be provided to purchase land surrounding a facility to a certain distance to prevent human occupation of potentially hazardous sites. Development rights or easements could also be employed. Many state hazardous waste management laws contain provisions for land management. Indiana, for example requires owners to place restrictions on their deeds prohibiting land disturbance after closure. Kansas requires land to be owned by

operator in "fee simple" (i.e., absolute and unconditional ownership); Michigan has provisions to restrict future uses of sites without permission.

3.1.2 Monitoring/detection.

Mechanisms for monitoring for potential hazards to residents of potential host communities could be utilized to alleviate local fears or anxieties and to alert people to a problem should it occur. Radiation detectors would provide assurance to people that they are safe and enable officials to detect potential problems. Many states with hazardous waste management programs require mandatory safety inspections of facilities on a regular basis. Given problems of institutional credibility, independent monitoring by the community may be required.

3.1.3 Emergency response/preparedness.

Personnel, equipment and information could be provided to the community to respond to a problem should it occur. This capability would reduce potential damages should there be an accident. In some states, hazardous waste facilities must prepare emergency contingency plans before beginning operations.

3.1.4 Safety design.

More stringent than "normal" safety features could be engineered into facility design and infrastructure to ensure public safety. Trade-offs exist between costs and safety to workers and to the public (Kasperson, 1980). While all plants would be built to a design standard, added safety features would always be possible at greater costs. For example, communities in Massachusetts may negotiate with facility developers over facility construction and design, operating and monitoring procedures and health and safety considerations in siting hazardous waste facilities.

3.1.5 Public education.

A program could be established to teach the public about disposal facilities and their safety design as well as what to do in an emergency. This could be an integral part of many incentive systems.

3.1.6 Socioeconomic impact mitigation.

Before the siting of a facility, plans could be developed and advance payments could be made to prevent negative socioeconomic impacts associated with facility construction and operation. A variety of ways of implementing mitigation programs are feasible (see 3.3.1).

3.1.7 Land value guarantees.

Land and property values could be guaranteed against a real decline in value due to the facility. This could include a program where people wishing to relocate would dedicate their property to the facility and/or government and be paid the fair-market value.

3.2 Compensation

Compensation is defined here as payment for actual damages in the event of an emergency, an accident, or other unforeseen calamity. Definitions of compensation always include the notion of loss or defect which is repaired, replaced or otherwise recompensed. The "counterbalancing" of a lack or a loss is another common thread in more specialized definitions. O'Connor (1980) indicates that the traditional view of compensation involves a "make-whole" concept or providing replacement costs. This implies that people can be reimbursed for social costs, which is true only to the extent that it is possible to recreate the status quo. Some changes in local conditions are quantifiable but not directly traceable to waste facility siting; these impacts are compensable in theory but not in practice because of the difficulty in developing a precise compensation scheme (Bacow, 1980).

The significant interests of states in equitable siting may be implemented by a state policy of encouraging, compelling, or directly

providing compensation to local communities (McMahon, et al, 1981). State requirements for compensation by developers tend to legitimize these concepts and mute charges of bribery. The legal basis and precedent for requiring compensation for redress of damages appears to be well-established, unlike that for providing benefits beyond those required to redress actual or potential adverse effects (McMahon, et al, 1981).

At least four types of compensation--trust funds, insurance schemes, guarantees and contracts--can be defined.

3.2.1 Trust funds.

A fund could be created with contributions by the government, industry, or both (e.g., "Superfund"). This could be a lump sum or a yearly contribution, accruing interest. The fund could be used to compensate people suffering damages should an accident occur or an anomaly be discovered.

Difficulty could exist in establishing the level of money that would be placed into the fund. This stems chiefly from uncertainties and disagreements over the risks and potential damages from an accident or unforeseen health effects. Furthermore, the process by which compensation would be awarded and administered is likely to be complex. For example, Florida's Recovery and Management Act calls for the establishment of a Hazardous Waste Management Trust Fund to finance emergency actions through a 4% excise tax on disposal until the accrual reaches \$30,000,000 and 2% thereafter. Other states have or are developing similar programs. The extent to which these funds could be used to compensate for damages is unclear.

3.2.2 Insurance scheme.

The Federal government or a private company could create an insurance pool in which all or part of the premiums would be paid by the government and/or industry. Claims for damages could be filed against this pool. Precedents for Federal involvement in insurance for low probability/high risk events include the

Price Anderson Act and the National Flood Insurance Program. A significant problem with an insurance scheme is that it may cause people to suspect that something negative is likely to occur, although there is some evidence of more positive reactions to such schemes (Kunneuther, 1979). Some states, such as Kansas and Oregon, are adopting legislation for hazardous waste facilities which require owners to possess liability insurance.

Currently it would be difficult to set the appropriate minimum aggregate coverage on liability for accidents at radioactive waste storage facilities. This problem is highly evident for chemical hazardous waste management as well (Wolf, 1980).

3.2.3 Assumption of liability.

The Federal government and/or industry could provide written assurance to assume liability to a certain level of damages from an accident or anomaly. Legal action could be taken to recoup losses. Most states which have developed statutes on hazardous waste management require the developer to assume liability for environmental damage and adverse health and safety impacts.

3.2.4 Contracts.

The Federal government and/or industry could enter into a contract with a local government to compensate for accidents or anomalies.

3.3 Rewards

Rewards are used to denote the type of incentives that might be used to induce communities to accept concentrated costs and risks such as changes in community character, the stigma presently associated with garbage disposal or "dumping" activities, and residual risks to public health when the benefits are realized on a much broader scale.

Assisting in solving national problems by assuming additional burdens is not very compelling to local populations (Brenner, 1979). Rewards may take many forms and may be negotiated with individual communities.

These must be perceived as positive inducements, however, and not as (1) payment for actual damage; (2) a form of conscription where the poor

of the land are paid for their willingness to accept the refuse of their richer neighbors; or (3) "buying off" the local community on health and safety considerations. If perceived as either of the latter two situations, the reward will be viewed as a bribe. A broad variety of rewards have been identified.

3.3.1 Direct payments.

Single or yearly payments could be made to communities, or to families and individuals residing within the community. A variety of implementation schemes to accomplish this is available. In addition, the level of the grant can be determined in a number of different ways.

Potential schemes so far include government grants, user fees, revenue sharing, gross receipt taxes, and waste surcharges. For example, Indiana's Hazardous Waste Facility Site Authority Act calls for a host county to receive \$50 per ton of hazardous waste disposed of in or on the land. Recently it has been suggested that a tax on the nuclear industry would enable grants to communities of \$5,000 per household or a direct grant to families of a like amount (Radioactive Waste Management, 1981). Georgia has proposed a 1% gross receipt tax on hazardous waste. Kentucky authorized counties to collect license fees on waste facilities. Ohio has authorized the expenditure of \$500,000 over 3 years in the form of local grants to encourage the siting of hazardous waste facilities. The National Governors Association has recommended a special congressional discretionary fund to provide benefits to state and local governments to promote acceptance of low-level nuclear waste disposal sites (NGA, 1980).

If the facility could make payments in lieu of taxes, the transfer would occur directly between the facility and the community. A variety of other transfers of this type are also possible. These offer the advantage that since they are assessable to the facility, facility users will bear their burden. Other transfer payments could occur between the state and the community or the Federal Government and the community. Again a variety of options are available ranging from such general purpose funds as general or special purpose revenues, revenue sharing, planning grants, and special project grants to specific waste facility impact grants. These payments offer the disadvantage that funds are paid out of the general revenues of some other government and may not be borne by facility users.

3.3.2 Provision of bonus community services.

Funds could be provided to support services that are not required as part of a mitigation scheme. Examples are job training programs, scholarship funds, amenities such as parks or cultural resources, or additions to essential services such as schools, police and fire protection, and public works. Direct service provision occurs when some service is provided either by the facility or by some higher level of government. This relieves the community of administering the service, but it may also lose control over the quality of the service. If the service is facility related, this loss may be unimportant, but if the service pertains to the community as a whole, difficulties may arise. These services could be funded by the facility or by a higher level of government.

3.3.3 Tax incentives.

Tax breaks to residents of impacted communities would be one means of using the tax system to provide incentives. This could be in the form of a state tax credit. An alternative scheme would use revenues from other incentives to replace funds collected through property or sales tax, and would adjust those taxes accordingly. When granting tax liability forgiveness to residents through the use of credits or deductions, the costs of such incentives may be borne by the general revenues of granting government, or may be financed by taxes on radioactive wastes sent to the repository.

3.3.4 Advance payments/subsidies.

Mitigation involves payment of funds to correct for negative impacts. An associated reward might be to provide funds before they would normally be allocated, or to help subsidize pre-impact planning and mitigation or non-impact related community functions by buying low interest municipal bonds or a related scheme. Both would provide communities with added benefits; in one case it would increase the amount of the funds by the amount of the interest that would accrue because of the early payment. In the other, the benefit would be the savings in interest over the existing lending rates.

3.3.5 Infrastructure development.

Along with the facility development, infrastructure to support additional and perhaps more desirable industry and commerce could be developed. It is known, for example, that the private sector typically considers local amenities, such as schools and hospitals, as important factors in their industrial location decisions.

3.3.6 Linkage.

The radioactive waste facility could be linked in a package with other more desirable Federal projects (O'Connor, 1980). Although antitrust laws concerning conditioning the sale or purchase of specific goods or services upon the purchases of another would have to be met, waste repository acceptance could be made conditional upon agreement on another Federal or state project.

3.3.7 Avoidance of other hazardous facilities.

Communities may be faced with a variety of other types of noxious facility sitings or undesirable land uses (Popper, 1981). This includes hazardous waste sites, correctional facilities, defense facilities, dams, airports and a number of other projects. Communities accepting a radioactive waste facility could be relieved of the burden of accepting other undesirables, even though current evidence in such facility siting indicates that new facilities are very often located close to existing ones to minimize the political costs of such facilities (i.e., the stigma already exists). Interstate and regional compacts that distribute such facilities are good examples of how this concept can be implemented (State Planning Council on Radioactive Waste Management, 1981).

4.0 - A FRAMEWORK FOR EVALUATING INCENTIVES

The different types of incentives identified and classified in the previous section 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. The first set of criteria describes preconditions to the use of incentives in siting (What is absolutely necessary?); the second set relates to objective characteristics of the incentive itself (Will it work?); the third focuses on community understanding of the incentive mechanism (Can it be understood?); and the fourth considers the impacts of the incentive on the community. Figure 2 presents a simplified view of our evaluative framework, with the criteria appropriately grouped.

The purpose of these criteria is to characterize alternative incentives or incentive systems for comparative purposes. It should be noted, however, that no single "best" alternative may emerge from an evaluation. By themselves, the criteria will not even indicate goodness or badness. Some criteria for example, may favor an incentive mechanism which promotes income inequality while others may mean that an incentive will lead to greater income equality. These are value and policy questions beyond the scope of this evaluative framework.

4.1 What Is Absolutely Necessary?

The use of incentives in siting hazardous facilities is not a panacea for the current siting difficulties but is instead a mechanism requiring

EVALUATION OF INCENTIVES

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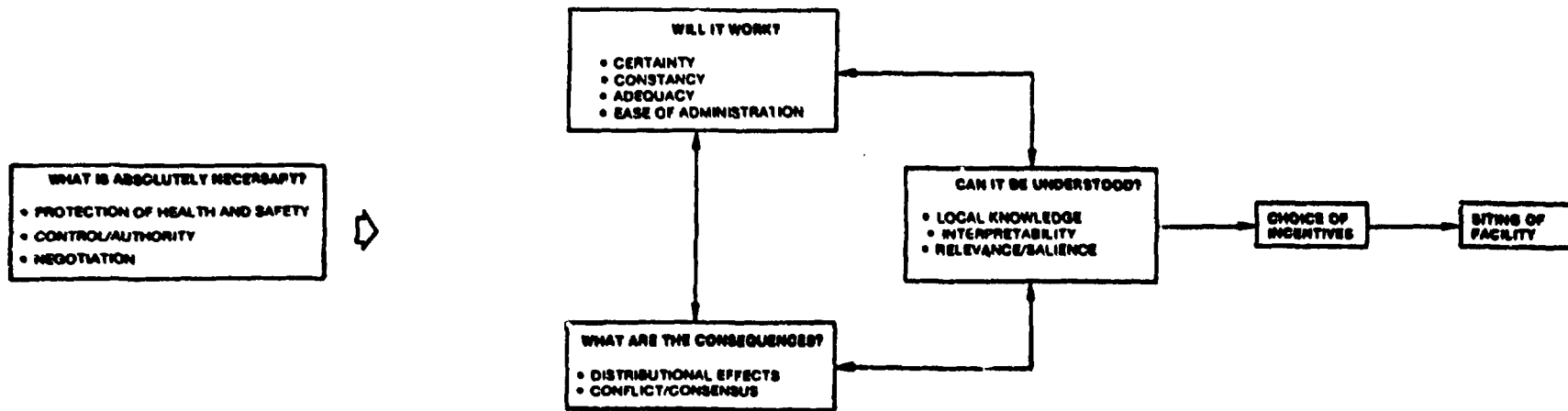


Fig. 2 - Systems for radioactive waste repository siting

careful judgments and fine tuning to local circumstances. In the current atmosphere of suspicion, fear and distrust of regulatory agencies and facility developers, 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.

The development of a more trusting environment in which to conduct siting efforts is not an easy order or one quickly accomplished. Public confidence in most institutions of government and business has shown a steady and substantial decline in recent decades (Lipset and Scheider, 1978). Numerous siting controversies in recent years may be a reflection of the same phenomenon. Despite wide variations in region and technology, the results display similar patterns: disputatious proceedings conducted in an atmosphere of distrust and anxiety, often resulting in stalemate or no siting. These controversies suggest that outcomes are dependent in part on the participants' confidence (or lack of it) in the siting process and upon their belief in the possibility of equitable resolution of disagreements.

Lack of trust is both a cause and an effect of siting difficulties. If skepticism or distrust permeates the interactions of key participants in the siting process, the results may be seen not only in conflicts that arise but also in the framing of issues and partisan use of technical information (Mazur, 1981). When regulatory agencies are perceived to have bypassed or violated their own procedures, the fallout is erosion

of trust among local citizens and groups (Ames, 1978) or even guerilla warfare against the physical manifestations of the decision as in the Minnesota powerline dispute (Casper and Wellstone, 1981).

Efforts to address the problem of confidence have been undertaken by groups such as the State Planning Council on Radioactive Waste, the National Governors Association, the National Association of Counties, the National Conference of State Legislatures, the Atomic Industrial Forum, the Chemical Manufacturers Association, the Environmental Protection Agency, various states, and environmental interest groups. A review of past siting efforts confirms that trust is not created by the exercise of federal preemptive powers which ignore local concerns and reject local participation (Bacow, 1980).

If the missing benefits (see Sect. 2.3) are to be supplied to enable a "willing trade" of local acceptance for such facilities, local stakeholders must be involved (Haymore, 1981). Negotiations thus become a key mechanism in the process, which, if conducted successfully, is one means of creating and enhancing trust in the arrangements. Such a process gets to the heart of the siting matter: determination by the local interests of the balance between risks and costs (impacts) and benefits which they are willing to accept.

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 context within which: (1) trust can be developed, (2) costs can be identified and evaluated by

local interests, (3) incentives can be suggested, and (4) bargaining can be conducted. The absence of any one of these preconditions can result in siting failure because of local demands for exorbitant levels of assurance and restitution and/or strategic withdrawal of key local interests from the siting process.

4.1.1 Safeguards for health and safety

The presence of adequate, reliable, and enforced regulations that protect the health and safety of residents near a proposed radioactive waste facility is a vital precondition for use of incentives. Much of the opposition to such facilities arises from the belief that such facilities endanger health and safety. Both the degree and probability of risk from normal and abnormal operations of the proposed facility may be in dispute. Existing regulations are often not known, or their functioning is discounted and viewed as unreliable. The agencies responsible for enforcement of existing regulations may not be respected or trusted. In these circumstances, the introduction of possible incentives to accept a facility may only be received as an illegitimate attempt to persuade people to trade their health and future well-being for certain benefits; anger in the local community and charges of bribery may be an inevitable result.

Obviously 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 proceeds to determine what level of safety would be acceptable to them under what conditions. Additional guarantees, over and above 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. Premature introduction of the subject of incentives may only be counterproductive until this precondition has been met.

4.1.2 Control/authority

A local role in developing and implementing siting arrangements is another precondition for the use of incentives. No local control or total local control is not feasible, given the realities and requirements of siting hazardous facilities. No local control in the siting process will likely eliminate a community's willingness to host a facility; total local control would at least initially allow the local community to demand unreasonable sums of money and/or services from whom-ever provides the incentive. The end result of either option (no control or total control) would be the same - the facility would not be sited.

What are the appropriate roles of local communities and their citizens, the state, facility operators, the U. S. Department of Energy, and facility users (utilities) in developing and implementing an incentive

system? How much of each type of incentive (i.e., mitigation, compensation, and reward) is required? How are these values determined and by whom? When is each type of incentive implemented and under what conditions are they implemented? Who triggers the implementation of each type of incentive? How are disagreements on the answers to any of these questions resolved? Answers to all of these questions are predicated upon a determination of the proper role of various actors in the incentive design and implementation process.

4.1.2.1 Federal, state and local relations. It is necessary to consider the dichotomy caused by current Federal/state negotiations (e.g., those involved in the consultation and concurrence process) and the Federal/local or Federal/state/local negotiations that may be required for siting repositories. Waste management and land use have traditionally been local prerogatives (Carnes et al., 1980), and only with the passage of the Resource Conservation and Recovery Act (P. L. 94-580) did the Federal government attempt to exercise any significant control in these areas. More importantly, formal and informal working relationships already generally exist between Federal and state entities and state and local organizations. The formation of similar local/Federal ties could be cumbersome. Brenner (1979) itemizes two points of contention in the triadic relationship and offers a possible resolution:

Contention 1

- If funds for impact mitigation are allocated directly to local governments, the governors may fear that local politicians will use the connection to establish their own power bases.

Contention 2

- When states are allowed to distribute Federal payments, states tend to hold on to the money, thus possibly damaging mitigation efforts (see also Gibbons, 1980).

Resolution

- To provide timely assistance to localities without undermining the power and influence of the state governor, states might be offered control of the mitigation funds, provided they agree to assist in the site selection process.

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 (Reiser et al., 1980) and cooperative federalism (Smith, 1980) have been more widely used in the waste program in describing Federal/state relationships, the shared powers approach as put forth by Kevin (1980) appears to best describe the balancing of interest among all relevant governmental units. The basic features of Kevin's shared powers system are: (1) the provision of forums for exchanging information and grievances, and (2) a checks-and-balances system allowing the state under some circumstance to halt some Federal siting activities and Federal power to override state objections given certain conditions. At

issue in this approach are the timing and degree of specificity, types and limits of power, relative emphasis on cooperation and conflict, methods of resolving disputes, and mechanisms for expressing arrangements. The State Planning Council is currently involved in considering shared powers arrangements between Federal/state governmental units. There appears to be a legitimate need to include a local component to this process, even at this late stage. Certainly there are sufficient differences in approach and needs between state and local units to require specific consideration.

4.1.2.2 The Local Constitutency. Once it is conceded by the Federal and state governments that the local community has a legitimate role in participating in the design and implementation of a siting strategy, including an incentive system, the major problem in evaluating the utility of one local control system versus another rests upon a determination of the suitability of particular institutional arrangements for local decisionmaking as an input. That is, how can local interests be aggregated and be put into external decisionmaking processes (i.e., Federal and state)? Should conventional elected leaders (e.g., city councils, county commissions) represent all interests within the potential host area and participate in incentive design and implementation? Should new organizations be invented and staffed through the electoral process? Should issues relevant to the facility and the incentive be decided through referenda? Should persons representing all significant interests within a community (e.g., health care, education, religion,

finance, minorities, environmentalists, etc) be appointed to a local incentive design board and then have an elected commission oversee implementation of the incentive?

The arguments for and against each of these options depend largely upon which and whose values are to be optimized and upon peculiarities of local political systems. If one of the values to be optimized is legitimacy of the incentive, of its design process, and, ultimately, of the facility itself, then it is important to ensure adequate representation of affected local interests in the local incentive design process. Because of the structure of community political systems (e.g., biennial elections) and the incentive-design process time frame, it may not be advisable to utilize conventional elected leadership systems. If the issue of hosting a radioactive waste facility is highly controversial in the local area, it may be desirable to emplace a special design board. Whether the members of this board would be appointed or elected depends upon the adequacy of representation under either option and upon the traditions and concerns in the locality. In any event, it may be necessary under any incentive design option to gain community consensus on the incentive through a referendum after the community has conducted a thorough public information and education process (see Sect. 4.3.1).

The success of a local incentive design process would depend largely upon the ability of local participants to represent their constituencies and to resolve intra-community conflicts through bargaining, negotiation, and compromise. Although these avenues of community conflict resolution may not result in a consensual decision, at

the very least they should identify areas of disagreement and allow community members to judge trade-offs for themselves.

4.1.3 Negotiation

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 (Susskind, 1981).

The central issue to be negotiated is under what conditions, if any, a facility can be sited in a community. Incentives enter the negotiations as a possible means to offset some unacceptable risks and/or increase local benefits. Brenner (1979) affirms Seidman's (1980) view that a policy consensus is most likely to be reached by the creation of negotiating situations among contending parties (Seidman maintains that if power is balanced among classes and interests, concessions are necessary).

Most radioactive waste negotiations have thus far been conducted only between Federal and state jurisdictions. There are an increasing number of examples of negotiation processes (including some involving incentives) which specifically incorporate local participation to be found in the developing field of hazardous waste management. The National Governor's Association (NGA) (1981) outlines a negotiation approach led by local representation. This approach narrows the agenda of items to be negotiated; generates alternatives to the proposed

facility; weighs impacts; and identifies possible compensatory actions, implementation mechanisms, and guarantees. NGA specifically recommends that funds be provided by the developer to the potential host community to enable the community to gather its own information and hire its own experts to ensure more credible and useful negotiations. The Massachusetts Hazardous Waste Facility 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 (NCSL, 1980). Council powers include:

1. assessing project-related social and economic impacts,
2. awarding technical assistance grants to local assessment communities,
3. determining compensation from developer to abutting communities, and
4. framing disputed issues for submission to binding arbitration between the developer and the host community.

Though the need to negotiate is accepted by most participants in the siting process, it is not clear that DOE has the authority to negotiate agreements even with states. Morris (1980) reports that:

as late as February 1979, in a response to Congressman John Dingell, then Secretary Schlesinger of DOE stated that the policy of his agency was that DOE would not make a final decision to proceed with construction of a waste repository within any state if the elected leadership of the state actively opposed such a decision. However, GAO questioned whether the executive branch could commit itself to state concurrence in the absence of express Congressional authorization. The doctrine of Federal immunity generally insulates the Federal government from state interference with its policies and programs in the absence of Congressional consent. While the executive branch could possibly make such a commitment without Congressional authorization, it would probably not be bound by it.

This clearly indicates that 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.

4.2 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.

4.2.1 Certainty

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 (Krawetz, 1979). Public opinion of Federal competence and responsiveness in the management of radioactive waste is often low due to a variety of factors:

1. delay of the Federal government in formulating a national radioactive waste management plan (Kevin, 1980; Kasperson, 1980);
2. problems of competence and reliability, which include fears that safeguards are insufficient (Kevin, 1980), that financial controversies will arise post-closure (e.g., as with the West Valley site in New York) (Kevin, 1980), or that the waste project could be abandoned for safety or other reasons after the community has undergone significant changes and "front-end" costs (Brenner, 1979);
3. perceived insensitivity to state interests by Federal agencies, including failure to keep states informed of activities within their borders and failure to uphold initial agreements between state and Federal agencies (Kevin, 1980); and
4. perceived alignment with the nuclear industry to provide radioactive waste management more to serve industry's needs than to meet national energy and environmental goals.

These same issues 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. A stable funding mechanism could assure states that funds are available to remove or maintain wastes and, where applicable, for compensation and reviewing activities. 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 (NCSL, 1980).

4.2.2 Constancy

The constancy criterion attempts to measure the steadiness or, conversely, the variability of the incentive over time. At one extreme an incentive may be conferred in one sum or at one time. At the other, the incentive may be continuously applied or received. 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 concern in radioactive waste storage. Incentives that 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.

Because each extreme has positive and negative aspects, it cannot be stated which is preferable. Many studies point out that people prefer, in general, to receive benefits in the present instead of the future. On the other hand, intergenerational economic security is often judged to be an important dimension of social well-being.

4.2.3 Adequacy

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 designed 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 adequate? Are all the 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 (see Sect. 4.1).

People's perceptions of adequacy are highly variable and render a priori measurement of the degree of consensus about adequacy impossible. During implementation of a siting and incentive program, adequacy might be determined through a referendum of the population or one of the other local decisionmaking mechanisms referred to earlier (see Sect. 4.1.2).

4.2.4 Ease of administration

Developing and applying an incentive system which is impossible, difficult, or too costly to administer does not move the facility siting process in the desired direction. Ease of administration has a number of dimensions:

1. 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?
(Peelle, 1980; Rochlin, 1980).
2. Is the incentive system so complex that additional interacting layers of bureaucracy are required for administration?
3. Does the incentive system incorporate an appellate or renegotiation procedure which is burdensome, complex and time consuming? (Bjornstad and Goss, 1981).
4. Does the incentive system allow accurate forecasting so that the receiving jurisdiction can plan and budget with confidence?
(Bjornstad and Goss, 1981).
5. Are the administrative costs of implementing the incentive system disproportionately large? (Bjornstad and Goss, 1981).

It is likely that almost any proposed incentive system will require the design and development of some new procedures, institutions, and organizations. At the very least, the provision by the Federal government of incentives to host communities will almost certainly require

congressional authorization and appropriations. This, however, may be but the tip of the iceberg. State governments may have to pass or amend enabling legislation for local governments; local governments may have to invent new organizations and procedures for the development, negotiation and operation of incentives; implementation of the above legislation may require the recruitment and/or training of appropriate personnel and the provision of sufficient fiscal resources over long periods of time to ensure continuous operation of the incentive (and the facility). Successful institutionalization, in turn, requires a recognition of administrative legitimacy by affected interests.

In addition to the creation of new organizations and procedures, the administrability of the incentive system will be affected by the extent of interorganizational interaction required to develop and implement the incentive. Will Federal, state and local authorities be required to concur on all or some decisions? How will the various layers of decision-making coordinate their activities? Will decisions be made on a hierarchical or tiered basis? What will be the relationship of community residents to the local government and to the facility operators in the implementation of the incentive? What will be the relationship of the community, community residents, and facility operators to those responsible for implementing the incentive? (See Sect. 4.1.2).

The ease of administration will also be affected by the complexity of potential appellate and renegotiation procedures that may accompany

the incentive system. Although one of the objectives of the incentive system is to establish certainty with respect to the responsibility and liability of the facility operator to the community and its residents, occasions may arise wherein the established procedures and their associated outcomes or impacts are inappropriate due to the occurrence of unanticipated events and/or trends. Because these situations may adversely affect either the community and some or all of its residents or the facility operator, procedures may be needed to establish how appeals and negotiations are to be resolved. In turn, the complexity of these procedures can affect how easily the incentive system can be administered.

Prior determination of the suitability and adequacy of an incentive system for a particular facility depends upon accurate forecasting of project-related and incentive-related impacts. These projected impacts, in turn, affect the abilities of recipient individuals and jurisdictions to plan and to budget. If the incentive system does not encourage accurate forecasting of project-related and incentive-related costs and benefits, it will not be possible for incentive recipients to plan or to budget with confidence. Relevant disciplines, particularly risk assessment, are immature and may seriously constrain accurate forecasting by recipient individuals and jurisdictions, and, thus, complicate the administration of the incentive system.

Finally, the ease of incentive administration may be jeopardized by disproportionate administrative costs. These costs will vary by the extent of complexity in the administrative system, the number of governmental units involved in the administrative system, the complexity of the

appellate/reneqotiation process, and the sophistication and accuracy of of impact forecasting methodologies, among other factors.

Each of these five factors or 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.

4.3 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 mollifying public opposition. While the preceding section has set out a number of criteria for characterizing the incentive itself, this section discusses a number of criteria for characterizing how members of the local community perceive and understand the incentive system presented to them. As Kasperson (1980) notes, "One of the troublesome issues in the current efforts to formulate an acceptable solution to nuclear waste management is that our understanding of the problem as it is defined by the public continues to lag seriously behind our technical and managerial accomplishments." (Author's emphasis). How the incentive system is translated by the community, then, is another fundamental determinant of whether the incentives will actually succeed in overcoming community opposition.

Although there are probably any number of criteria that could be proposed for characterizing local community perception of the incentive system, we consider the three most important: (1) the level of local

knowledge and awareness of the facility and the incentive; (2) the ability locally to interpret the purpose and understand the proposed implementation of the incentive; and (3) the relevance of the proposed incentive. In other words, is the community aware of the incentive, do they understand it, and do they feel it is relevant to their concerns?

4.3.1 Local knowledge and awareness

A necessary first step is to determine the extent to which the community is aware of the existence of an incentive. It is quite likely that members of the potential host community will be aware of the proposed waste repository. This awareness can be traced to the national publicity given environmental problems, particularly those related to radioactive and hazardous waste after the incidents at Three Mile Island and Love Canal (Duberg, et al., 1980) and to any local publicity regarding the particular facility. This knowledge of the facility itself, however, 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.

4.3.2 Interpretability

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. For example, some members of the community might interpret the offering of any incentive as an indication that the facility is a greater risk than its developers have led them to believe. Questions such as the following may be raised: "If this facility is so safe, why are they paying us to take it?"

Alternatively, some groups within the community may be unable or unwilling to distinguish between the purposes of various legitimate incentives and a bribe. To such groups, any incentive will be seen as a bribe. It may be, however, that this response is 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 (Rankin, 1981). Until incentive systems become a much more common and accepted siting mechanism, this response is likely to remain fairly typical. Change in attitudes may occur as such techniques become recognized as legitimate. In the case of both the structure and function of an incentive system, the more the

public understands its actual goals and the true purpose for which it is proposed, the more likely the incentive system will be able to contribute to a reduction in local opposition.

4.3.3 Relevance

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 and less likely to be viewed as a bribe.

This criterion is closely related to that of interpretability, and, indeed, one of the major problems in assessing this criterion is separating a lack of understanding from a lack of belief that the incentive will be implemented or is proper. Further, this criterion may generate intergroup conflict within the community; various interest groups may have different perspectives on what is a relevant incentive. Although this fragmentation may seem an insurmountable problem, Lindblom (1965) suggests it may actually develop more innovative arrangements and encourage the participation of a broad range of interest groups in the implementation process. This process of resolving conflicts over the incentive system is discussed in more detail in Sect. 4.4.2.

Measurement of all three of the criteria related to community characteristics may require a survey of public awareness of the incentive, with additional questions to probe the breadth and depth of understanding, and opinions about the incentive's relevance. Other appropriate information-gathering techniques might include a content analysis of relevant public meetings and local news media (particularly related stories, editorials, and letters to the editor), and discussions with local leaders.

4.4 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.

4.4.1 Distributional effects

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.

In dealing with equity or distributional effects, the states have clearly indicated that where physically possible, waste should be stored in the state where it originates (Kevin, 1980). Disposal is not feasible in each state because many states lack suitable geologic media and because the cost of siting more than a few radioactive waste repositories may be prohibitive. The concentration of nuclear power use along the Eastern seaboard and the Great Lakes and the concentration of suitable sites for nuclear waste disposal in remote, sparsely populated or arid areas of the United States, primarily in the West (Ausness, 1971) create the possibility of a serious spatial maldistribution of benefits and burdens.

The distributional effects of alternative incentive schemes (i.e., mitigation, compensation, and reward) are likely to vary. Mitigation mechanisms would be designed to prevent some impacts and reimburse for any unavoidable costs associated with the construction and normal operation of the facility. The impacts of mitigation are likely to be bimodally distributed on a geographic basis. Those persons adjacent to a facility would be allocated a disproportionate share of some mitigation mechanisms, as measured on a per capita basis; ideally, however, their

share of mitigation would be proportional to the actual costs and risks they would be expected to bear. Other mitigation measures, such as public education and monies to reimburse for local capital expenditures to meet the demands of facility construction and operations, would be allocated to all citizens through their local governmental jurisdiction. The temporal distribution of mitigation could be designed in a variety of ways to accommodate current and future generations.

Compensation would be distributed to individuals who actually suffer harm as a consequence of an accident or other operational anomaly. The compensation system could be designed to insure a fair distribution of resources. However, the actual allocation of compensation might be skewed as a consequence of local inequalities in terms of access to compensation institutions; one example is access to the courts in the case of insurance schemes. Efforts could be taken to assure equal access to compensation through establishment and maintenance of sufficient legal resources to protect the interests of the poor, those normally unable to utilize fully the judicial system in their own interest.

It might be particularly difficult to design a reward system which allocates resources fairly. Unless substantial care is taken in the design and implementation of the incentives, the rewards identified in Section 3.3 (i.e., direct payments, bonus community services, tax incentives, advance payments, infrastructure development, tying, and avoidance of other noxious facilities) could accrue to members of the local community equally, with no special provision made for those persons at greater risk (i.e., those directly adjacent to the facility).

While this may be appropriate for rewarding for some of the costs and risks assumed by the local community (e.g., change in community character and the stigma of being a dumping ground), other rewards may need to be differentially allocated according to residential proximity to the facility and/or work at the facility. In these cases, some of the rewards mentioned above might be modified in order to acknowledge this special situation; particular government services and programs could be targeted in these areas. Similarly, reward systems could be designed so that future generations are rewarded for decisions made by their forebearers; it might be required, for instance, that this part of the incentive be renegotiated periodically.

4.4.2 Generation of local conflict or consensus

It can be expected that the siting of any hazardous facility, such as a radioactive waste repository, will generate local conflict and opposition (U.S. EPA, 1979; O'Hare 1977). 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 period of 50, 100 or 500 years.

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 important 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 the 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 decisionmakers.

The possibility of conflict due to the facility and the incentive should not obscure the significant role an incentive system can have in developing community consensus supporting the siting of a repository. As indicated in the next section, there is some evidence that incentives increase local support for hosting a repository and that the support is predicated upon a multi-dimensional incentive system - one that includes, for instance, transfer payments, access to information, and participation in repository operation. Any of these factors alone is insufficient to the development of consensus.

It is important to recognize that consensus, as an operational concept, is in itself multi-dimensional. It is not certain, from a quantitative standpoint, how much support is required before a consensus is attained. It is certainly more than a majority and can be less than unanimity; conventionally it means that two-thirds to three-fourths of a given population (i.e., community) support a particular action. The principal reasons why a consensus is required rather than a simple majority is to minimize the possibility of losing so much support over time that the initial decision would be reversed. In a policy arena such as radioactive waste repository siting, where a reversal could have significant adverse impacts such as litigation if not outright closure and decommissioning, it is obviously important that a substantial consensus supporting the facility be achieved.

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, as mentioned previously, 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 would be necessary to develop consensus. Negotiations will not automatically produce consensus, but they are likely to increase substantially the possibility of consensus.

The determinants of the conflict/consensus criterion are quite varied. They include site/community-specific features (e.g., political culture, degree of urbanization, population heterogeneity, socioeconomic

status, etc.), input factors (i.e., project and incentive related inputs) and contextual variables (e.g., trust, method of presentation and local participation). Incentive-related inputs include factors such as the interpretability of the incentive system, the extent of local control in the development of the incentive system, who pays for the incentive, and the relevance/salience of the incentive system.

4.4.3 Resolution of adverse consequences

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 occurrences?

Awareness of such a possibility is the first step. One can also systematically evaluate the causes of such outcomes and design a siting process that 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 essential that siting and incentives be assessed in a community context. The framework and criteria described in this report, though based on a comprehensive review of relevant literature, were developed to a large extent inductively; their utility to potential siting decisions can be judged effectively only by members of a potential host community.

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 (Painter, 1981; NGA, 1981), and potential models are available (NCSL, 1980; Carnes, forthcoming). Experimentation with community participation in repository siting and incentive design and implementation processes would not only help to corroborate or reject totally or in part 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.

5.0 - INCENTIVES: SOME EMPIRICAL DATA

Some evidence about incentives is available from a 1980 survey of 420 Wisconsin residents in three rural counties.* The counties included one which is the site of a nuclear power plant but which is not perceived as a potential site for a nuclear waste repository and two counties which are potential waste repository sites. Disposal of nuclear wastes has been a source of public controversy in one of these latter two counties.

The interviewees were randomly selected from telephone directories. Eight interviewers conducted the interviews between 10:00 a.m. and 9:00 p.m. May 20 through June 9, 1980. Interviewers were trained and their performance was monitored. Because of the methods used there are disproportionately more females and older people than there are in the total population. When this is controlled, the distribution of attitudes toward nuclear power and waste repositories in this sample are similar to those in larger, national samples.

When asked initially if they favored or opposed the construction of a nuclear waste repository in their community, 6% strongly favored such a project, 16% mildly favored it, 7% mildly opposed it and 64% strongly opposed it. Seven percent replied that they didn't know or failed to respond. Later in the survey, respondents were presented with a list of incentives and asked if the provision of a particular incentive

*The poll was conducted by John Kelly, Complex Systems Group, University of New Hampshire. The analysis presented here is an extension of that work.

or package of incentives would represent a sufficient level of local control over a nuclear waste repository. The incentive question was followed by a question which asked whether the respondent would accept a waste repository in the community if the incentive package he/she had chosen were provided. By comparing this response to the response to the earlier question about a repository in the community, it is possible to determine whether people changed their minds about siting a repository after being exposed to the idea of incentives. The percentage of those who said they would accept a repository increased from about 22% without incentives to about 42% when incentives were available (see Fig. 3). The percentage of those who were unsure increased from 7% to 11%.

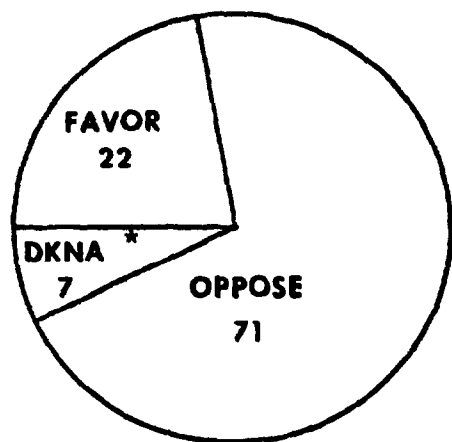
Although the survey was conducted before the development of the conceptual framework described in this document, the incentives used in the survey can be related to those in our framework (see Table 3). Access to information and monitoring are clearly mitigation incentives. Substantial payments to the community can be a form of compensation or reward, depending upon the need the payments are projected to fill. Representation and the power to shut down the facility are less clear but might be thought of as preconditions.

The incentives were ordered to reflect what the researchers felt was an increasing level of community control. The phraseology of a "sufficient level of local control" was chosen in an attempt to avoid the connotation of "buying-off" the respondents. The incentives were not presented to the respondents as independent items. Rather, each incentive was added to those previously presented (the "list" was read each time) until the respondent indicated that a "package" of incentives

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BEFORE INCENTIVES



AFTER INCENTIVES

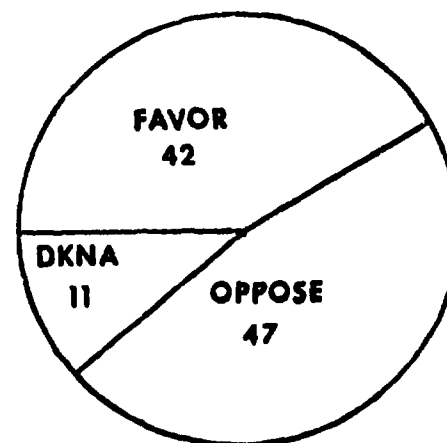


Fig. 3 - Impact of incentives on local attitudes regarding the siting of a radioactive waste facility in own community (percentage)

*Don't know/no answer

would be sufficient. For example, respondents were asked if substantial payments to the community were sufficient for local control over a nuclear waste repository. If they responded with "no," they were then asked if a substantial payment and access to information would be sufficient. If they answered "yes," the survey taker skipped the remaining probes and went on to the next question. As long as the respondent said "no," the questioning continued until the "list" of incentives was exhausted.

Table 3 shows the cumulative distribution of responses to the incentives for the entire sample. This distribution is instructive because it gives an indication of how a population in general would respond to different types of incentives. What is remarkable about this distribution is its relative uniformity. The two largest categories (17% each) include those who would accept substantial payments or those who would find a repository unacceptable under any circumstances. The addition of the incentives of information, monitoring, representation, or the power to shut down a repository each added about 10% of the respondents. At face value this suggests that each of these incentives would encourage more people to accept a waste repository.

It is one thing for people to perceive that a package of incentives would give greater control. It is something else for people to act upon those perceptions and to change their position on siting a nuclear waste repository in their community. As was pointed out earlier, about 20% of the sample became more accepting of the idea of a nuclear waste repository

in their community after being exposed to incentives. The question arises as to which incentives would encourage respondents to change their minds.

Table 4 shows the distribution of persons who, after being exposed to incentives, said they would change from opposing to accepting a repository in their community. The information incentive had the most impact. This was followed by the incentives of payments to the community, the power to shut down the facility, independent monitoring and representation on a governing board. The reader should recall that the incentives are cumulative. An important observation to be made from this distribution is that there is no incentive that leads people to change their minds. The percentages in Tables 3 and 4 are not directly comparable because the number of categories varies. When the distributions are repercentaged to reflect equal numbers of categories there are no substantial differences.

Men were significantly more likely than women to become more favorable to siting a waste facility in their community when offered incentives (Table 5). Although not statistically significant, there was a tendency among those with higher family incomes to respond favorably to siting a repository in their community when offered incentives. There were no discernible systematic differences by age and education.

The experiences and setting of the community did influence how people responded to incentives. Significantly greater numbers of people (Table 6) living in the community that had a nuclear power plant but no perceived potential as a waste site changed their minds than did people

in communities which had no existing nuclear plants but which were being considered as possible sites for a waste repository. On the surface, the amount of public debate over a repository in potential host communities did not seem to influence the efficacy of incentives.

Several points need to be made with respect to this analysis. First, although the incentives used in the analysis can be related to those in the framework, the analysis does not parallel the conceptual scheme presented in the previous chapters. The survey was undertaken for different purposes before the conceptual scheme was conceived. The analysis is presented to demonstrate that incentives may have some utility.

Second, the sample is limited to three communities in Wisconsin. Generalizations to larger populations need to be made with care. Even so, there is substantial consistency between the findings in this sample and those from larger and more representative national samples. For example, national studies of attitudes toward nuclear power have shown consistently strong relationships between sex and attitudes toward nuclear power but fairly weak or negligible relationships between nuclear attitudes and the variables of education and income. Thus, it comes as no surprise that proportionately more males changed their minds about siting than females while the differences by income and education were not significant.

Third, the data suggest that there are non-economic incentives (e.g., independent monitoring and access to information) that may

contribute significantly to public acceptance of a radioactive waste repository in a local community. The data also suggest that packages of incentives rather than single incentives may be required to gain acceptance. Further analysis is required to determine whether the acceptance of different types of incentives vary with social and demographic characteristics.

Finally, it should be pointed out that a 20 percentage point shift in the acceptability of siting a repository in a local community would seem to be significant. However, this focusing of attention on specific incentives may detract from the main point of this paper. It is the process of negotiating about incentives that is important and not just the incentives per se. In a real situation, the acceptability of a nuclear waste repository might be much less or much greater after the negotiations of the incentive process.

Most previous studies have stressed Federal/state relationships in repository siting, excluding both the concerns and potential role of potential host communities. Given the centrality of local community acceptance of a repository, it is important that potential incentives be assessed in a community context. Our research framework, though developed from a comprehensive review of relevant literature, is primarily inductive; potential host communities must evaluate its true utility. Local governments and, in turn, the members of potential host communities should be included in Federal/state discussions and institutional arrangements.

Table 3 - Distribution of the acceptance of incentives
to site a nuclear waste repository among Wisconsin residents

(N = 426)

Incentive	Relative Percentage	Cumulative Percentage ^a
Substantial payments to your community	17	17
Access to information	13	30
Independent monitoring	12	42
Representation on a governing board [of the facility]	10	52
The power to shut it down	11	63
Other	3	66
Unacceptable under any condition	17	83
Don't know - no answer	16	99

^aThis represents the person who would have chosen the particular incentive and all those preceding it on the list.

Table 4 - Distribution of persons who changed their position to accept a waste repository in their community by type of incentive package

(N = 77)

Incentive	Relative Percentage	Cumulative Percentage
Substantial payments to your community	17	17
Access to information	13	30
Independent monitoring	12	42
Representation on a governing board [of the facility]	10	52
The power to shut it down	11	63
Other	3	66
Unacceptable under any condition	17	83
Don't know - no answer	16	99

Table 5 - Favorability (for respondents initially opposed to a waste site) to siting a nuclear waste facility in the respondent's community after exposure to incentives by selected demographic and social characteristics

	Remained Unfavorable	Became Favorable	Number of people initially opposed to a waste site
	(Percentage of Category)		
<u>Sex</u>			
Male	59	41	80
Female	77	23	189
<u>Family Income</u>			
Under \$5,000	77	23	31
\$5,000 - 9,999	70	30	33
\$10,000 - 14,999	73	27	63
\$15,000 - 19,999	65	35	49
\$20,000 - 29,999	68	32	50
\$30,000+	54	42	24
<u>Age</u>			
18-20	62	38	8
21-24	76	24	21
25-29	63	37	38
30's	74	26	57
40's	72	28	40
50's	67	36	42
60+	73	27	63
<u>Education</u>			
8th grade or less	76	24	37
Less than High School	65	35	26
High School	67	33	143
Some College	75	25	36
College Graduate	83	17	17
Graduate Work	75	25	8

Table 6 - Favorability (for respondents initially opposed to a waste site) to siting a nuclear waste facility in the respondent's community after exposure to incentives by community setting

Type of Community	Remained	Became	Number of people initially opposed to a waste site
	Unfavorable	Favorable	
	(Percentage of Category)		
Nuclear host community with no waste site potential	59	41	121
Potential waste site where there has been little or no discussion of possible siting	81	19	63
Potential waste site where there has been public discussion of possible siting	79	21	90

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