NIMBY and Banning New Local Nuclear-Related Land Uses: Public Reactions at United States Major Nuclear Weapons Legacy Sites

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Abstract

The NIMBY response has made finding locations where nuclear technologies can be developed and tested, where nuclear waste can be treated and stored, and where electricity can be generated using nuclear fuel a major challenge for the United States. United States government-owned land that already has nuclear-related activities is a logical place to look for public support for new nuclear-related activities. In order to determine public preferences for a policy that would prohibit new nuclear-related activities at U.S. Department of Energy (DOE) sites we surveyed 1351 people who lived within 50 miles of six DOE sites. Sixty percent agreed with the prohibition in their location, and 42 percent labeled the policy a high priority (10 on a 10-point scale). Yet, 40 percent did not consider the policy a priority; and 18 percent labeled it a low priority (1 on a 10-point scale). Opponents of nuclear prohibition in their areas (hereafter referred to as the “local ban”) did not worry much about the DOE’s activities, trusted the DOE, and were familiar with the site. A clear policy challenge to those who support siting new nuclear-related land uses at these sites is to increase the base of those who trust the DOE and increase familiarity with the site by engaging with the public and with their community representatives.

Key words: risk perceptions, nuclear technology, nuclear power, nuclear waste, trust, facility siting
The acronyms LULUs (locally unwanted land use) and NIMBY (not in my
backyard) symbolize public sensitivity about locating factories, electricity generating
stations, highways, commercial, public facilities, and other land uses in their
neighborhoods (Popper, 1981; O’Hare et al., 1983; Lake, 1987; Boholm, 2005; Portney,
1991). Places that will accept new nuclear-related research and waste management
facilities, and electricity generating stations are surely among the most difficult to find.
The Ninth Circuit of the United States Court of Appeals observed that that society wants
the benefits of nuclear science, but not the resulting legacy (United States Court of
Appeals for the Ninth Circuit, No 3-35711, Natural Resources Defense Council v.
Abraham, (p.s.).

U.S. government-owned Energy Department lands that have already hosted
nuclear-related national security activities for half century are logical places to locate new
nuclear-related facilities. The bulk of military high level nuclear waste has been located
at three U.S. Department of Energy facilities in Hanford (WA), Savannah River (SC),
and the Idaho National Laboratory (INL, ID). Hanford, Savannah River and INL are each
hundreds of square mile in area and located in relatively rural settings (Office of
Environmental Management, 1995a,b). These three might be the best choices for new
nuclear-related activities. But there are many other U.S. Department of Energy and U.S.
Department of Defense sites, which seem at least initially to be reasonable places for
some of these activities. For example, Oak Ridge (TN) is a fourth DOE site that has a
long history of nuclear-related activities, although it is smaller and located in a more
urbanized area than the first three sites. And, there are more than 100 other sites
currently or formally under the control of the U.S. Department of Energy. For example,
Fernald (OH), and Rocky Flats (CO) represent small DOE sites located in metropolitan. Both of these sites are being closed. We would not anticipate much support for new nuclear-related land uses at the last two sites. But we should not guess the degree of NIMBYism (the local ban), rather we should measure it.

Ethically-grounded opposing viewpoints exist about locating new or additional nuclear-related activities at these already nuclear locations. Arguments in favor are that for national security and economic reasons the United States cannot be without such technology; some who live near the sites would approve of facilities because of the economic benefits; and many of the people in these areas have worked at these sites and know people who have, and may not worry about site-related hazards.

There is some evidence to suggest less NIMBYism at these DOE sites than elsewhere. For example, Burger (2000) surveyed hunters, sportsmen, and the general public about future land-use preferences for the Savannah River nuclear weapons plant in South Carolina. She found less public opposition to the idea of nuclear storage from people who lived closer to the site than from people who lived further away. A survey of 502 Idaho residents in 2006 (Nemich, 2006) found that over 60 percent supported INL’s nuclear research mission, which includes a plutonium project and research on nuclear reactors. Over 70 percent had a favorable opinion of the Idaho DOE site. Outside the United States, Mcfarlane and Ewing (2006) reported that Swedish and Finnish companies chose sites for nuclear waste storage in places that already had nuclear facilities. In other words, there is evidence to support the idea that some new nuclear-related missions could be located at existing government-owned sites that already have nuclear activities.
An opposing viewpoint is that already-nuclear sites may not be safe for new nuclear-related missions. The fact that they already have nuclear-related land uses should not be taken as presumptive evidence that it is safe to add new activities. Before any new nuclear-related land use is permitted at the sites, they should be evaluated for health and safety limitations. Furthermore arguably these sites should not become sacrifice zones for the nation by accepting all the nuclear-related development, testing and waste management in the United States.

Ethically based arguments are important starting point, but cannot replace accurate knowledge of the perceptions of the people who would live with new nuclear-related missions. This paper describes the results of a year 2005 survey of residents who lived within 50 miles of the above-mentioned six major U.S. Department of Energy nuclear facilities. The purposes of this paper are to answer two research questions:

1. What proportion of residents want to prohibit new nuclear-related activities, that is, support the ban at the former weapons sites in their regions?
2. What factors, such as, risk perceptions, trust of authority, location, and demographic characteristics are associated with this preference?

The paper is divided into four sections. The following section describes expectations about public perceptions of nuclear-related activities and factors that should predict public support or opposition to a no new nuclear policy. The second section reviews the survey methods and the statistical tools, which range from simple descriptive statistics to multivariate discriminant analysis. Section three presents the answers to the two research questions. The final section reviews the limitations of the work, summarizes the results and focuses on the public policy implications. Based on the results of this study, we
briefly compare and contrast the processes that have been followed in seeking a permanent storage facility for high-level nuclear waste at Yucca Mountain with an approach that might face less public hostility, that is, move the answer to the siting question from a presumption of no to maybe.

Expectations

As recently as the past five years, the risk perception literature makes a strong case that a clear majority of the general public would support a nuclear prohibition policy. Nuclear war, nuclear power and nuclear waste are among the most dreaded and unknown risks. Slovic (1987) observed that nuclear power ranked first among college students and members of the League of Women Voters out of 30 different risks. In South Korea, Cha (2000) found nuclear weapons/war, nuclear weapon tests, and nuclear reactor accidents ranked 1, 2, and 4, respectively, among 70 risks. Also, disposal of radioactive wastes, transportation of nuclear materials and nuclear power plants ranked 11, 12, and 19, respectively. In Chile, Bronfman and Cifuentes (2003) observed that nuclear weapons had the highest dread among 54 risks. Nuclear power ranked fourth. In China, Xie et al. (2003) observed that respondents ranked nuclear war number 1. Nuclear power was less feared, ranking 27 out of 28 risks. Overall, with a few exceptions, people are worried about the use of nuclear technology, most obviously about nuclear weapons. But many also are worried about the use of nuclear materials to generate electrical power and about storing nuclear waste.

With regard to the two research questions in the United States context, Kunreuther’s et al. (1990) study of the proposed Yucca Mountain nuclear waste repository shows the daunting challenge of trying to site a new high level nuclear waste
storage facility, even in area that already has had many nuclear-related activities. The authors asked 1001 residents of Nevada if they would be willing to accept the repository, which is located about 90 miles north of Las Vegas. The surveys offered economic incentives, including annual tax rebates of $1000, $3000, or even $5000 per year for 20 years. Relatively few respondents changed their opposition to the facility, even with tax relief. The controversial Yucca Mountain facilities may not be representative because they involved siting high-level nuclear waste in a single location. What the study does show is that the NIMBY attitude is not necessarily addressed by financial incentives.

A NIMBY response to storing nuclear waste is not limited to federal government proposals. Private Fuel Storage, a consortium of eight nuclear utility companies, and the Goshute Indian Tribe have proposed a nuclear waste storage facility in Skull Valley about 50 miles southwest of Salt Lake City, Utah (Macfarlane and Ewing, 2006; Greenwire, 2006). The proposed storage site is being contested by the state of Utah, members of the tribe, and many others. The reason for this high level of distress about nuclear-related technology begins with images of nuclear weapons that killed many people in Japan during World War II (Hinman, et al., 1993; Weart, 1992). The nuclear reactor mishaps at Chernobyl and Three Mile Island underscored the fears, especially since people recall and trust negative information about risks more than positive information (Koren and Klein, 1991; Siegrist and Cvetkovich, 2001; Skowronksi and Carlston, 1989; Slovic, 1993). These powerful negative images are reinforced by movies and television shows; they are not going to go away.

Public perceptions, however, could be different, at some former nuclear weapons facilities. Prohibiting new nuclear-related missions will mean less employment and gross
regional product in places that have become dependent on the DOE for jobs and income (Authors, 2003). This would be particularly true for the Idaho, Savannah River, Oak Ridge, and Hanford sites. Researchers found that 19, 16, 14, and 16 percent, respectively, of the gross regional product of these areas is traceable to expenditures by the Department of Energy (Frisch, 1998). The Idaho site is the most economically dependent. The Savannah River site and the Idaho sites have sought new Department of Energy missions. In contrast, the Hanford site is heavily dependent, but appears to be focused on clean-up of the site, not on new missions (U.S. DOE/RL, 2003; Authors, 2000). Oak Ridge, Tennessee, has a long history of other energy-related activities, including national security and waste management. In contrast, the contamination at the Rocky Flats and the Fernald sites has been remediated, less than 3 percent of gross regional product is associated with the DOE site, no new activities are planned, and, therefore, we would expect respondents who live near Rocky Flats and Fernald to be for the local ban.

These site-specific expectations, however, are confounded by personal familiarity, which would vary for every resident at each of the six sites. The literature shows that those who are more familiar with a risky activity tend to become less concerned about it (Halpern-Felsher, et al., 2001). At each site some proportion of the respondents will have worked at the site, or will have a spouse, relative, or close friend who has worked at the site. Those familiar with the facilities and activities should be expected to be less supportive of a local ban than those who are unfamiliar with the site. Overall, we expected to find that a clear majority of respondents would prefer a local ban. Yet, we
also expected an opposite pole to emerge that would consist of people opposed to this idea because they do not worry about the risk and they perceive economic benefits.

With regard to the second research question (predictors of public preference for a local ban), we had five expectations. First, those who were the most worried about existing site activities, possible new activities, and off-site transportation-related accidents would favor a local ban. Second, some people worry about many risks and others worry about few (Baxter, 1990; Gillespie, 1999; Authors, 2005). Those who are worried about DOE’s on-site activities, we expected, would also be more likely to be concerned about local environmental issues, such as mining and manufacturing pollution, loss of open space, natural hazards, and have concerns about the future of the local environment.

Third, trust of the DOE and government in general was expected to be a predictor. When people feel that authority is incompetent, unfair, not acting in good faith, and does not share their values, they are not going to trust it (Earle and Cvetkovich, 1995; Nye, 1997; Pew, 1998; Poortinga and Pidgeon, 2003; Slovic, 1993). Those who do not trust the DOE, other parts of the federal government, and state and local government should be more supportive of a local ban policy.

In most LULU and NIMBY circumstances, distance from the site is a predictor of public responses. Those who live closest should be more concerned than those who live further away. In essence, the literature shows that smell, sound, noise and property values are major correlates of public concerns (Clay and Hollister, 1983; Authors, 2000; Williams, et al., 1999, 2001). Distance, we believe, is in the nuclear facility case confounded by personal knowledge and associated desensitization. Accordingly, our
fourth expectation was that those who know nothing about the site and live farther away would be more supportive of the local ban than those who work at the site and live closer.

Respondent demographic characteristics were expected to confound perception, trust, familiarity, and site-related differences (Bord and O’Connor, 1997; Finucane et al., 2000; Flynn et al., 1994; Authors, 2005; Vaughan and Nordenstam, 1991). Our fifth expectation was that there would be more support for the local ban by African and Native/Indian Americans, women and the relatively poor than from non-Hispanic white, male and more affluent counterparts.

**Data and Methods**

We designed a survey instrument with more than 70 questions to answer the two research questions, as well as other questions that were part of a larger study. With regard to a local ban, we asked respondents, how important this policy was to them. A 10-point scale was used: 1=very low priority to 10=very high priority.

Twenty-nine independent variables were created to answer the second research question (predictors of preference for a local ban). Three questions asked about fears regarding the DOE’s ability to clean up and manage existing and new wastes and about transportation accidents. A four-point scale was used: very worried, somewhat worried, not too worried, not at all worried. The next two questions asked how worried they were about their local environment, and do they believe that the local environment will be better, the same, or worse in 25 years.

Two of the 29 variables asked about economic concerns. We asked respondents to tell us if they worried about people losing their jobs as a result of the Department of Energy reducing their on-site activities and not starting new activities. Then, we asked if
economic growth should be given priority, even if the environment receives less protection. The opposite choice was also offered, as part of the same question. Respondents were also permitted to volunteer that both should be given equal priority. Variations of this question are widely used in public surveys, although it poses a false dichotomy, that is, presumes that economic growth is and environmental protection cannot co-exist (Gallup, 2003; Saad, 2004).

We asked six questions about trust. Respondent were asked if they “strongly agreed,” “agreed,” “disagreed” or “strongly disagreed” that the Department of Energy can be trusted to effectively manage waste on the sites, and to manage any new waste. A third trust question asked if the Department of Energy communicates honestly with the public. Three questions asked if the federal, state, and local governments were doing “too much,” “too little,” or just “about the right amount” to protect the environment of the local area. These three questions measured the public’s comfort with the efforts of their governments.

With regard to location, as noted earlier, the six study sites are different in size, function and history. We created a simple yes-no variable for each of the six sites in order to capture site differences. With regard to distance from the site, we sampled out to 50 miles and compared the responses of those who lived up to 20 miles from the site with those who lived between 20 and 50 miles away. We asked about familiarity with the site. Respondents were asked if they had ever heard of the site, how familiar they were with it, had they visited, driven by or through the site, and had they or a family member ever worked there. We aggregated these familiarity questions into a single variable with six
categories, where 1=worked at the site (most familiar) and 6= never heard of the site (least familiar).

The last set of questions asked for demographic information: age, race/ethnicity, educational achievement, income, and gender.

The (Authors) school administered the questionnaire over the phone using random digit dialing and American Association for Public Opinion Research standards. Our target was 200 responses at each of the six sites, in other words, at least 1200 responses. The survey process excluded bad numbers (e.g., not a resident, not in service). Each good number was called up to seven times. Of those who were reached, 71 percent cooperated. Including all the good numbers who were contacted seven times, the response rate was 44 percent.

With respect to methods, we used descriptive, bivariate and multivariate statistics as described in greater detail in the results section.

Results

A total of 1351 samples were collected from July 14 through August 2, 2005. These included 225 at five sites in 226 at one site. Table 1 shows demographic data for each site. There were inter-site differences. United States Bureau of Census records for the six areas in the year 2000 show that these differences reflect the realities of the six regions. For example, there was a larger proportion of college-educated respondents in the Rocky Flats sample than in the Savannah River and Hanford samples, which reflects the reality of these areas. The Savannah River sample has a larger proportion of African-American respondents, which is consistent with the demographics of that region.

Table 1 about here
Question 1. Preferences for Prohibiting New Nuclear-Related Facilities

The first column of Table 2 shows that 42 percent of the respondents wanted a no nuclear-related activity policy to be a very high priority (rating of 10 on a 10-point scale). Yet, a second mode was composed of 15 percent of people who did not think that this policy should be a priority (rating of 1). Clearly, as anticipated, there was considerable disagreement in preference among respondents, although adamant supporters outnumber adamant opponents of the local ban policy by almost 3 to 1. Of the remaining 43 percent of respondents, 18 percent were supporters and 25 percent were against the policy. If rating of 1-5 represents opposition to the policy and a rating of 6-10 represents support for the policy, then 40 percent oppose the policy and 60 percent favor a local ban.

Table 2 about here

Table 2 also shows wide variations among the six sites. Rocky Flats and Fernald, where major remediation and cleanup efforts are ending, and the sites will be turned over to the Department of Energy’s Office of Legacy Management for long-term stewardship, showed strong support for a local ban. In contrast, as anticipated, there was much greater ambivalence at the other four sites, especially in Idaho where a clear majority did not favor the policy.

Question 2. Correlates of Preference for the Policy

We used discriminant analysis and ordinal regression to help clarify the importance of different independent variables. Both methods produced similar results with respect to determining the strongest predictors of the ban. We present the discriminant analysis results. Table 3 shows the relationship between 20 predictors and the ban. First, the 10-category dependent variable was collapsed into 4 categories because
the variable had three distinct modes and could not be normalized for ordinary least squares regression analysis. We retained all the responses of 10, that is, the highest priority is category 4. All those who rated the ban from 6 to 9 were assigned a score of 3. Those who scored the ban between 2 and 5 were assigned a score of 2. And those who assigned no new nuclear activities as 1 (lowest priority) were assigned a score of 1. In other words, we retained the two opposite poles (which accounted for 57 percent of the responses) and aggregated the other 43 percent into two intermediate categories.

Table 3 about here

The results of the discriminant analysis are reported in Table 3. Two types of data are presented in this table. One is the average value for each of the four groups for each of the 20 variables. For example, with regard to the variable worry about new nuclear-related activities at the site (the first row in Table 3), group 4, which is the group that most strongly supports the ban, had an average score of 2.2 (range of 1 to 4). In strong contrast, group 1, which was least supportive of that policy, had an average score of only 0.6. Displaying the average values in the Table 3 aids in reviewing the results.

The second set of information in the table is the correlations between the predictor variables and the three discriminant functions. The discriminant functions are linear combinations of the original dependent variables. A high correlation between a predictor variable and a discriminant function means that the variable is a good predictor. Twenty of the independent variables had a correlation of at least 0.25 with one of the three discriminant functions, and four had correlations of >0.5, and are the strongest predictors. These are reported in Table 3 and discussed in the text.
This paragraph briefly summarizes how to interpret the results of a discriminant analysis. Three discriminant functions are created when the original dependent variable, in this case, the ban policy, has four categories (n-1). Discriminant functions are named in two ways. One is by examining the patterns of correlations between the predictors and the discriminant functions. For example, the three highest correlations between the first function and predictors are with variables that measure worrying about DOE-related activities. Therefore, function one clearly is related to worrying about the DOE. The second way of determining the focus of the discriminant function is by examining the average score of the cases that constitute each of the groups. For example, with respect to the first discriminant function, the average score for group 1 was -1.4 compared to an average score of 0.73 with group 4. Since these are standardized scores, and the average value for all the cases is 0.0, function 1 is clearly distinguishing between groups 1 (low priority) and 4 (high priority).

With that context, the first function of the discriminant analysis contrasted those who are most worried about the DOE and other environmental issues with those who are much less worried. We called it the “DOE-worried function.” Seven variables had correlations with this function of ≥0.25. These respondents worry about new activities at the site that involve the use of nuclear materials (r= 0.762), about the cleanup of radioactive materials at the site (r=0.620), and about accidents when materials are transported to and from the site (r=0.515). Also, these respondents do not believe that the economy should be given priority over environment: (r=-0.304 with economic priority versus environmental priority). They worried about environmental problems in the county (r=0.278), they do not have much personal experience with the DOE site.
(r=-0.250), and these respondents disproportionately were not non-Hispanic White
(r=-0.271; they tended to be African-American). This function clearly distinguished
between those who strongly favored the ban (average score for group 4 was 0.73) and
those who most opposed it (average score for group 1 was -1.40). In other words, the
average group 1 and group 4 respondents were over 2 standard deviations apart.

The second function was called the “opposed vs. favored” function. Those who
favored the ban had little, if any, knowledge of the DOE site (r=.530), and they think that
the environment and their county will be worse 25 years from now than it currently is
(r=0.289). These respondents tended to be female (r=0.349), and disproportionately lived
near the Fernald site (r=0.355) and not the Savannah River site (r=−0.321). The second
function discriminated between groups 1-2 and groups 3-4. The average score for groups
1 and 2 (opponents of the ban) was -0.49 compared to an average score of 0.32 for the
supporters of the policy (groups 3 and 4). Summarizing, this is primarily a site experience
and site location function.

The third function was the weakest in terms of discriminating power. However, it
was certainly the most interesting with regard to tying the ban to trust. Noting that high
trust was measured as 1, whereas low trust was measured as 4, the correlation between
trusting the DOE to effectively manage any new waste and this third function was
r=0.448; it was r=0.350 with managing any existing waste on the site, and trusting DOE
to communicate honestly with the public in the area was correlated at r=0.324.

Also part of this “trust” function was general public perception of government
efforts to protect the environment in the local area. Those who did not feel that the DOE
can effectively manage waste on the DOE site also tended to perceive that the federal
(r=0.384) and local (r=0.355) governments were not doing enough to protect their local environments. These respondents tended to be slightly older than their counterparts (r=0.329), disproportionately they lived near the Rocky Flats site (r=0.453), and not near the Idaho site (r=-0.261). An interesting additional fact about this function is that it contrasted group 4 respondents (all scored 10 on the no new nuclear mission dependent variable, average score of group 4 respondents was 0.43) with all three other groups (average score of groups 1, 2, and 3 was -0.30). In other words, function three is separating the strongest supporters of the ban from everyone else, including those who rated this policy option from 6 to 9. The function is underscoring the importance of trust in molding public perception.

The linear model derived from this discriminant analysis accurately classified 56 percent of respondents (predicted people to be in the group that they actually said they were in), including 70 percent of group 1 and 66 percent of group 4. It accurately classified 37 percent of group 2 and 47 percent of group 3. Nearly all of the misclassifications were with the adjacent group.

We were particularly interested in a group of respondents that rated a non-nuclear policy option as a low priority (score equaled 1). We ran several additional discriminant analyses with the four groups. The most interesting one used only two predictor variables: familiarity with the site, and trust DOE communications to the public. These two variables accurately classified only 37 percent of all respondents. Notably, however, they accurately classified 61 percent of the respondents that rated a no new nuclear-related policy as a low priority (score equals 1). This additional discriminant analysis underscored the importance of trust and familiarity in overcoming the NIMBY reaction.
Discussion

Before reviewing the public policy implications of the study, we reiterate some limitations and how they can be addressed in future research. First, we would have benefited from questions that asked about public preferences for specific nuclear-related activities such as, waste management, nuclear-powered electricity generation facilities, new nuclear test reactors, and weapons development. Second, the survey was asked of residents who live within 50 miles of one of six DOE sites. A random sample of people who live near other logical choices for such activities (Department of Defense, existing large nuclear electrical generating sites) and a national random sample with the same questions would have provided comparison populations. Given the results about trust, we need a substantially expanded set of trust-related questions that probe technical competence and communications. Next, we need questions regarding public preferences for future land uses, not just nuclear-related land uses.

With regard to theory, we found nearly all the relationships that we had anticipated, with an obvious exception of the economic consequences on the local areas, which was less important than has been anticipated. The study suggests the need to dig more deeply into the public’s prioritization of economic, environmental and public health consequences of new nuclear-related missions. By surveying in other areas, we anticipate learning more about the public’s perceptions of new nuclear-related activities, economic benefits they perceive of such activities, environmental and other externalities, and personal values they bring to bear on the issue. While some of this can be done with survey research questions, such as those used in this survey, deep insights about the
trade-offs people make are more likely to be found in focus groups or in face-to-face interviews with people.

Given the limitations of this survey, we do not want to overstate policy implications or assume that these findings are true of other locations. Nor, however, do we want to dismiss the policy lessons that can be drawn from this research. Proponents of a ban at these locations can cite these findings as evidence that a majority of respondents at five of the six sites are opposed to new nuclear-related activities, and that the modal response was that a non-nuclear policy is preferred. Furthermore, they can argue that even if there was public support for new nuclear activities at these sites, the sites are unlikely to be suitable because of health and safety risks. Proponents of siting new nuclear activities at the sites have evidence that there is not a near-universal desire for these activities to be prohibited at the four most likely locations.

Looking at these results from the perspective of planning and risk analysis policy, we interpret them as moving the policy discussion from a presumptive no-new-nuclear-facilities policy to a more tentative may be willing to consider these sites for nuclear science research, temporary management of waste products, and in several cases, even electric power generation using nuclear fuels. We believe that policy discourse about siting nuclear-related activities in the United States has been too strongly influenced by the processes involved in choosing a so-called “permanent” nuclear waste product facility at Yucca Mountain in Nevada. That multibillion-dollar effort over several decades has produced a large tunnel, storage site, scientific uncertainty and controversy, and dominates media coverage of nuclear-materials issues (Macfarlane and Ewing, 2006). While space does not permit a review of the reasons for the problems with the Yucca
project, for the purposes of this paper it is important to point out that the first part of that project was to identify any site that was physically acceptable. That part of the project was never completed, leaving a single location in Nevada as the only possible site and leaving residents of that state to feel that they had been betrayed by the federal government.

What we are suggesting here as a planning process is notably different. If, in fact, it can be confirmed by additional survey research that some nuclear technologies are acceptable in some places, then the federal government has the option of pursuing open and transparent communications with interest groups in the regions while simultaneously examining the advantages and disadvantages of specific locations from the health and safety perspectives. If the sites are not suitable because of health and safety reasons, then none of these sites should be used. But if some are suitable and there is public support, then siting should not be precluded.

In this regard, the authors of this study have found that with regard to nuclear-related issues local officials and community representatives are interested in open interactive dialogue, not just and one-way communication and outreach, a point experts in risk communications have been saying for well over a decade and planners have found to be the case in many projects (National Research Council, 1989; Burger, et al., 2005; Hance, 1990). For example, in the case of radiological contamination of Amchitka and surrounding areas of Aleutian Alaska, some members of the public and their representatives were interested in discussions of values and principles, but many were also interested in viewing and discussing technical data about radiological contamination.
The major lesson learned was not to assume that we already know what people will be interested in.

Tracked to the siting of new nuclear-related activities, we would advise coming to such discussions with only two assumptions. One is that based on previous surveys of the sites, the public and their representatives are willing and able to think about these sites as multiuse facilities. That is, local officials, planners, and community representatives are able to envision the sites as national environmental research parks, for recreation, and for national security missions. The second assumption is that community groups are going to want independent scientists to look at the health and safety issues. This may mean scientists who live in the surrounding region, but this is not always the case. In our experience, they may even feel more comfortable with experts from outside the area.

Overall, this study confirms that even as energy necessities begin to lead the population to become more open to nuclear and other non fossil fuel energy sources (Bisconti, 2005) that have been dreaded for so long, the task of actually siting the facilities to allow the work to obtain the energy and dispose of the wastes it generates faces a set of linked value and thought processes that create a virtual Gordian’s Knot. Whether these concepts can be decoupled or otherwise addressed effectively is not clear. As noted earlier, the federal government’s Yucca Mountain site and the Utah site proposed by the utility consortium may never receive nuclear waste. The United States government faces a continuing struggle to find locations for new nuclear facilities. If the federal government hopes to locate new nuclear-related land uses without determined and probably successful political opposition, it will need to change its strategy for locating
such facilities, which is a very daunting challenge for government organizations. That it already owns some of the land is, as we have seen, a mixed blessing. That the government has a history of secretive actions that exclude or minimize the importance of local and regional considerations and participation creates additional presumption and expectation. Clearly, innovative approaches, backed up with very careful understanding of and empathy for the interrelated factors that have made NIMBY be the nearly universal response to most recent nuclear expansion, will be needed. This paper has attempted to provide new data about those linkages.

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Table 1: Respondent demographic characteristics: six regions

(Numbers in the table are percents)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Fernald</th>
<th>Hanford</th>
<th>Idaho Nat. Lab</th>
<th>Oak Ridge</th>
<th>Rocky Flats</th>
<th>Savannah River</th>
<th>Total</th>
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<td>Age:</td>
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<td></td>
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*Numbers do not necessarily add up to 100%, either because all the categories are not shown or because of rounding.
Table 2: Public preference for not allowing any new nuclear-related activity on the site

<table>
<thead>
<tr>
<th>Respondent priority</th>
<th>All sites, % (n=1351)</th>
<th>Fernald (n=223)</th>
<th>Hanford (n=222)</th>
<th>Idaho (n=223)</th>
<th>Oak Ridge (n=220)</th>
<th>Rocky Flats (n=225)</th>
<th>Savannah River (n=214)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-very low priority</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>14.8</td>
<td>4.5</td>
<td>20.3</td>
<td>27.4</td>
<td>14.1</td>
<td>4.4</td>
<td>18.7</td>
</tr>
<tr>
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<td>3.6</td>
<td>6.8</td>
<td>9.4</td>
<td>6.8</td>
<td>2.7</td>
<td>4.2</td>
</tr>
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<td>3</td>
<td>4.1</td>
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<td>6.8</td>
<td>9.0</td>
<td>3.2</td>
<td>1.8</td>
<td>3.7</td>
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<td>1.3</td>
<td>3.6</td>
<td>1.8</td>
<td>1.8</td>
<td>0.9</td>
<td>4.2</td>
</tr>
<tr>
<td>5</td>
<td>12.9</td>
<td>10.8</td>
<td>12.6</td>
<td>16.1</td>
<td>15.0</td>
<td>8.0</td>
<td>15.0</td>
</tr>
<tr>
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<td>2.3</td>
<td>2.2</td>
<td>0.9</td>
<td>3.1</td>
<td>3.6</td>
<td>1.3</td>
<td>2.8</td>
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<td>3.9</td>
<td>4.0</td>
<td>4.5</td>
<td>4.5</td>
<td>5.9</td>
<td>1.3</td>
<td>3.3</td>
</tr>
<tr>
<td>8</td>
<td>7.6</td>
<td>6.7</td>
<td>6.8</td>
<td>8.1</td>
<td>10.0</td>
<td>5.8</td>
<td>8.4</td>
</tr>
<tr>
<td>9</td>
<td>4.1</td>
<td>8.5</td>
<td>2.7</td>
<td>2.2</td>
<td>2.7</td>
<td>5.8</td>
<td>2.3</td>
</tr>
<tr>
<td>10 —very high priority</td>
<td>42.4</td>
<td>58.3</td>
<td>35.1</td>
<td>18.4</td>
<td>36.8</td>
<td>68.0</td>
<td>37.4</td>
</tr>
<tr>
<td>Average score</td>
<td>6.8</td>
<td>8.3</td>
<td>6.0</td>
<td>4.8</td>
<td>6.6</td>
<td>8.5</td>
<td>6.3</td>
</tr>
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</table>
Table 3: Discriminant analysis of support for the ban

<table>
<thead>
<tr>
<th>Variable (n=1327)</th>
<th>Average value by group</th>
<th>Correlation with Function</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Worried about new activities at the site that involved the use of nuclear materials (1= not at all worried, 4=worried a great deal)</td>
<td>0.6</td>
<td>1.2</td>
</tr>
<tr>
<td>Worried that the cleanup of chemical or radioactive materials at the site will expose residents to hazards (1= not at all worried, 4=worried a great deal)</td>
<td>1.0</td>
<td>1.6</td>
</tr>
<tr>
<td>Worried about accidents when hazardous waste materials are transported to and from the site (1= not at all worried, 4=worried a great deal)</td>
<td>1.1</td>
<td>1.6</td>
</tr>
<tr>
<td>Economic development should be given priority over environmental protection</td>
<td>0.45</td>
<td>0.32</td>
</tr>
<tr>
<td>Worried about environmental problems in the county (1= not at all worried, 4=worried a great deal)</td>
<td>1.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Respondent is non-Hispanic white</td>
<td>0.96</td>
<td>0.88</td>
</tr>
<tr>
<td>A lot of personal experience with DOE site (1= worked there, 6=never heard of it)</td>
<td>2.9</td>
<td>3.6</td>
</tr>
<tr>
<td>Female respondent</td>
<td>0.29</td>
<td>0.43</td>
</tr>
<tr>
<td>Fernald site respondent</td>
<td>0.05</td>
<td>0.10</td>
</tr>
<tr>
<td>Savannah River site respondent</td>
<td>0.18</td>
<td>0.20</td>
</tr>
<tr>
<td>Do you think that the environment in the county will be worse 25 years from now (1=better, 3=worse)</td>
<td>2.2</td>
<td>2.2</td>
</tr>
<tr>
<td>Oak Ridge site respondent</td>
<td>0.16</td>
<td>0.18</td>
</tr>
<tr>
<td>Rocky Flats site respondent</td>
<td>0.05</td>
<td>0.08</td>
</tr>
<tr>
<td>Trust DOE to effectively manage any new waste on-site (1=strongly agree, 4=strongly disagree)</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>US government is doing too little in terms of protecting the environment of your area (1=too much, 3=too little)</td>
<td>0.46</td>
<td>0.50</td>
</tr>
<tr>
<td>Local government is doing too little in terms of protecting the environment in your area (1=too much, 3=too little)</td>
<td>0.43</td>
<td>0.40</td>
</tr>
<tr>
<td>Trust DOE to effectively manage waste left on site (1=strongly agree, 4=strongly disagree)</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Respondent age, yrs.</td>
<td>50.3</td>
<td>47.5</td>
</tr>
<tr>
<td>The DOE communicates honestly with the people in this area (1=strongly agree, 4=strongly disagree)</td>
<td>2.0</td>
<td>2.1</td>
</tr>
<tr>
<td>Idaho site respondent</td>
<td>0.05</td>
<td>0.08</td>
</tr>
</tbody>
</table>