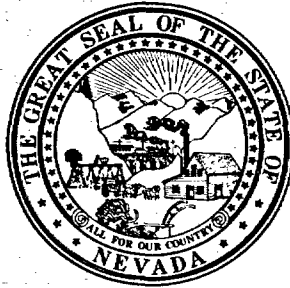


STATE OF NEVADA

**AGENCY FOR NUCLEAR PROJECTS/  
NUCLEAR WASTE PROJECT OFFICE**

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STATE OF NEVADA  
AGENCY FOR NUCLEAR PROJECTS/  
NUCLEAR WASTE PROJECT OFFICE

NWPO-SE-024-89

Executive Summary  
Yucca Mountain Socioeconomic Project  
An Interim Report on the State  
of Nevada Socioeconomic Studies

by

Mountain West Research  
Las Vegas, Nevada

June, 1989

The Nevada Agency for Nuclear Projects/Nuclear Waste Project Office was created by the Nevada Legislature to oversee federal high-level waste activities in the State. Since 1985, it has dealt largely with the U.S. Department of Energy's siting of a high-level nuclear waste repository at Yucca Mountain in southern Nevada. As part of its oversight role, NWPO has contracted for studies designed to assess the socioeconomic implications of a repository and of repository-related activities.

This study was funded by DOE grant number DE-FG08-85-NV10461.

## INTRODUCTION

The Interim Report on the State of Nevada Socioeconomic Studies summarizes the findings to date of a diverse, three-year research effort. The project involves scientists and researchers with expertise in economic-demographic, social-cultural and risk-related aspects of socioeconomic impact assessment. To date, this effort has resulted in the development of over one hundred reports and documents detailing research findings and approaches. Taken together, the various studies are designed to allow the State of Nevada and affected local governments and Indian Tribes to comprehensively assess the potential effects of a high-level nuclear waste repository on the economic, social and cultural fabric of Nevada.

The State of Nevada Socioeconomic Studies and the preparation of the Interim Report have been overseen by a State and Local Government Steering Committee comprised of representatives from the Nevada Agency for Nuclear Projects, the Nevada Legislative Counsel Bureau, Clark County, Nye County, Lincoln County, Esmeralda County, the City of Las Vegas, the City of North Las Vegas, the City of Henderson, the City of Caliente, the Western Shoshone National Council and the Moapa Band of Paiutes.

A Technical Review Committee comprised of experts in the fields of economics, sociology, anthropology, psychology, hazard assessment, community development, transportation, and the physical sciences was established early in the study process to provide advice on the design of the studies and to oversee research work of the study team. The Technical Review Committee reviewed and commented on drafts of the Interim Report, and the committee's recommendations are incorporated into the final document.

Copies of the full Report are available from the Nevada Agency for Nuclear Projects and may be obtained by contacting the Agency at (702) 885-3744 or writing to:

The Nevada Agency for Nuclear Projects/  
Nuclear Waste Project Office  
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## EXECUTIVE SUMMARY

When the United States Congress passed the Nuclear Waste Policy Act of 1982 and the amendments to the Act of December, 1987, it recognized the potentially significant socioeconomic dimensions of siting, constructing, and operating facilities for the storage and disposal of high-level radioactive wastes. Specific provisions were written into the Act to enable prospective host states, tribes, and local governments to carefully and comprehensively assess socioeconomic impacts associated with waste disposal facilities and activities.

The State of Nevada formally initiated a study of the socioeconomic impacts of a proposed high-level nuclear waste repository at Yucca Mountain in southern Nevada in 1986 after the Nevada site had been chosen as a potential waste disposal site. The State and affected local governments that participated in the development of the study recognized that the effort would need to go well beyond what is traditionally considered adequate for socioeconomic impact assessment because of the unique nature of the repository project.

As a result of Congressional action in 1987, Yucca Mountain is now the only location being studied by the U.S. Department of Energy (DOE) as a site for the nation's first high-level waste repository. The site must be found suitable by DOE, the President, and the United States Congress, and licensed by the Nuclear Regulatory Commission, before it can be developed and operated as a repository.

This *Interim Report* is a report on work in progress and presents findings from the research to date on the potential consequences of a repository for the citizens of Nevada. The research and findings in the Report have been subjected to rigorous peer review as part of the state's effort to insure independent, objective analysis that meets the highest professional standards. The basic research effort will continue through June 1990 and will enable the state to refine and clarify the findings presented in this *Interim Report*.

### HIGH-LEVEL NUCLEAR WASTE DISPOSAL

Disposal of high-level nuclear waste presents society with one of its most complex social and technological challenges. The search for an acceptable solution to this problem in the United States has been underway for several decades, with a history of shifting program directions, changing disposal preferences, frequent social conflict, intergovernmental tensions, and widespread media attention. To design and construct a repository that can contain the wastes for a minimum of 10,000 years, and to move the accumulated wastes from over a hundred waste generating sites across the country to a single national site will require a management system that integrates federal government agencies, state and local governments, waste generators, national laboratories, waste

shippers and carriers, equipment manufacturers, and many private contractors. These elements must be meshed into a reliable and smoothly functioning system that can accommodate the inevitable surprises and operate with a scant margin for error.

The issue is further complicated because nuclear power and radioactive waste are feared technological *hazards*. Experiments repeatedly show that people perceive these hazards as little understood and potentially uncontrollable threats that have the potential for catastrophic results. Wide-spread public concerns over the hazards of radioactive waste disposal create a special context for Nevadans, one which generates discussion, debate, and conflict. The intensity of the debate can be expected to fluctuate over time, but important concerns will continue to be expressed as long as the Yucca Mountain site remains a candidate for a repository.

Accompanying this condition will be a pervasive degree of *uncertainty*. Major scientific efforts to identify and assess the hazards associated with radioactive waste can be expected. However, the potential consequences of these hazards are not likely to be ever completely understood. The nature of future events and the types and magnitudes of the consequences will depend heavily upon future conditions that cannot be fully anticipated. The uncertainties associated with the repository stem from the number of variables affecting the repository, its mission, and the socioeconomic-environmental-institutional context in which it exists. These include: its extended time dimension (10,000 years); future national policies on retrieval, monitoring, and safety standards; transportation requirements to collect the waste from widely dispersed sites throughout the U.S.; the large number of ways by which human factors can alter the overall performance of the system; reactions of the public toward repository-related events; and public confidence in repository management.

In summary, the overall repository program must be visualized as having three dominant characteristics -- complexity, hazards, and uncertainty. Therein lie the principal challenges in anticipating the consequences of the repository for the citizens of Nevada.

## RESEARCH APPROACH

The objective of the Yucca Mountain socioeconomic studies is to provide essential information so that affected governments can meet their obligations to protect the safety and welfare of their citizens. Given the complexity, hazards, and uncertainties of the high-level nuclear waste repository program, any study methodology that claims precision in the anticipation of repository consequences must be viewed with great skepticism. However, the goal ultimately must be to describe the repository impacts as clearly as possible, both in their qualitative and, where possible, quantitative dimensions. What *kinds* of effects can be anticipated? Are the effects likely to be *harmful or beneficial* and to *whom*? Under what *conditions* could these consequences be significant? To what extent can these effects be *quantified*?

At one level, this research proceeds as does any other socioeconomic assessment. An interdisciplinary group of social scientists works together to define the cause and effect relationships linking the proposed project to political, social, and economic

conditions in the study area. Impacts are defined as the difference between conditions that would exist with the project as compared to conditions in the absence of the project. Causation is traced from economic effects of the project on employment and income to implications for population and settlement patterns. This provides the basis for analyzing demands for community facilities and services. Service costs are then compared to incremental revenues to estimate the fiscal impacts of the project. Finally, all of these consequences are assessed in the context of community values.

This basic approach is appropriate to the assessment of most major developments; its results are referred to as "standard effects." But the repository program also includes a unique set of characteristics resulting from the hazards of high-level radioactive waste. This introduces an entirely different category of cause and effect relationships; these are referred to as the "special effects." This *Interim Report* presents findings for both the standard and special effects.

### **STANDARD EFFECTS**

The project proposed for Yucca Mountain envisions a large and expensive undertaking of extraordinarily long duration. Ultimately, the national program will touch most parts of the United States as radioactive waste is collected and transported to the disposal site.

Direct DOE expenditures at the Yucca Mountain repository site are estimated to be \$8.1 billion in 1987-1988 dollars over the approximately 70-year period of characterization, construction, operations, and decommissioning. At the construction peak, total employment impacts could amount to 15,000 jobs (combining direct, indirect, and induced employment), which could result in as many as 24,000 more people than would be the case without the project. With the exception of the construction peak, total annual employment impacts are estimated to be 3,000 to 4,000 jobs, with associated population impacts of 6,000 to 7,000 persons. Much of this economic/demographic impact will occur in the Las Vegas urban area, but the greatest relative effects undoubtedly will be felt in the smaller rural communities.

At both the state and local levels, Nevada's public expenditures are more responsive to population growth than are public revenues. This is because a significant portion of the revenues under current tax structures come from visitor spending while expenditures are driven by services provided to residents. This fiscal structure means that any growth that does not increase the contribution of revenues from visitors will not pay its own way. In recent years the growth of gaming and tourism has kept pace with other forms of development. However, it cannot be assumed that the structure of the economy or the tax structure will remain the same into the next century.

The net negative impact to the State General Fund resulting from repository-related population growth is estimated at \$22 million during site characterization, \$27 million during construction, and \$41 million during the emplacement period. In addition, negative impacts for both county and municipal governments could amount to more than \$500 million over the 70-year period of repository activities. It should be understood

that these negative fiscal balances would accompany growth from any source not accompanied by a commensurate increase in gaming revenues.

Besides these population-driven consequences, state agencies will face extraordinary demands for oversight, public safety, and new facilities. These costs could range from \$85 million up to \$156 million, based on preliminary estimates made to date.

The costs of transportation infrastructure development and improvements to assure safe shipment of high-level radioactive waste could cost additional millions of dollars. Particularly troublesome in this regard is the level of information available on waste transportation. Remaining to be defined are the form in which the waste will be transported, the mode (rail or truck) of transport, and the routes that will be selected. The lack of adequate description for the transportation program, combined with the fact that impact analysis in this area has only just begun, identifies a major gap in the current understanding of the project. These limitations will be overcome only when the disposal program is better defined and as the associated research progresses. It is not clear yet what part of the transportation costs might be properly attributed to the repository program.

The major uncertainties associated with transportation are reminders that important uncertainties also exist for the entire range of economic, demographic, and fiscal analyses. These areas of assessment are best presented in quantified form, but the outputs of these analyses are subject to the same uncertainties as the assumptions upon which the analyses are based.

Against this backdrop of potential employment, population, and fiscal impacts, social and political change can be anticipated in the communities of the study area. Survey data over the past several years have consistently shown that about 70 percent of the residents in the Las Vegas Valley oppose the project and feel that the proposed Yucca Mountain facility would diminish their satisfaction with living in the Las Vegas area. However, there also is organized support for the repository. These conditions imply that groups on both sides of the issue will increasingly organize and become active in advocating their views.

The rural communities are generally less opposed to the repository than is the urban area, but there is substantial variation between communities. In the western study area communities of Indian Springs (in Clark County), and Amargosa Valley, Beatty and Pahrump (in Nye County), opposition to the project ranges from 13 to 35 percent and there tends to be less apprehension about potential health and safety effects than in the Las Vegas urban area. The eastern study area communities of Alamo-Hiko, Caliente, Panaca, and Pioche (in Lincoln County) and the Moapa Valley (in northeast Clark County) are more negative than the western communities (42 to 51 percent opposed), due partly to the experience of this area with the downwind effects of atmospheric nuclear testing at the Nuclear Test Site.

The differences of opinion that have been recorded for these rural communities suggest that there is potential for conflict, a decrease in community satisfaction, and

divisive political issues in response to the repository program. To fully understand Nevada attitudes toward the repository, it is important to recognize that both the urban and rural residents, despite their opposition to the repository, assume a degree of fatalism about the likelihood of the repository being built.

Native American communities also may experience significant impacts from the repository program. These impacts likely would be sociocultural in character and derive directly from strongly-held beliefs among Native Americans that the repository and related nuclear waste transportation are contrary to a proper relationship between people and the land. The repository also poses yet another obstacle to Native American attempts to regain their traditional tribal lands.

The full implications of the repository cannot be considered, however, without looking more carefully at its "special" consequences.

### ***SPECIAL EFFECTS***

"Special" effects -- those resulting from the inherently hazardous characteristics of high-level radioactive waste -- have the potential to affect Nevada in two ways. First, these hazard-related effects of the repository could diminish the quality of life for Nevada residents. Second, special effects have the potential to negatively impact the economic base of the state which is dependent on the willingness of people outside Nevada to visit, invest in, and move to Nevada. Given the dominance of the visitor economy in Southern Nevada (at least one-third of total employment or 100,000 jobs), realization of these effects would have profound impacts on all dimensions of political, social, and economic life in Nevada.

The special effects have the potential to impact Nevada's economy because of the way people react to their perceptions of the repository program. Simply put, media reports about the performance of the repository program could stigmatize all or parts of Nevada. This stigmatization could then influence the behavior of people and diminish visitation, migration, and economic development. An analogous case in point would be the American tourists who stayed away from Europe during the terrorist scares of 1986. Significant reductions occurred in visitor spending in the affected European countries, based upon the perceived risk that attacks by terrorists might occur while tourists were on vacation. In Chapter 2 a number of cases involving stigmatization are evaluated. For people in Nevada, the numerous reports of cases where behavior of visitors or tourists have been significantly affected by their perception of places, raises some fundamental questions. Will adverse risk-induced effects accompany events associated with the repository? What will be their magnitude? What will be their frequency and duration?

These issues were addressed first by directly asking individuals both in Nevada and throughout the U.S. about how they would behave in the presence of a radioactive waste repository. When the repository was postulated to be 100 miles from a community, about 40 percent of the respondents said the community would be less desirable for conventions; 50 to 60 percent felt it would be less desirable to visit; and 60 to 70 percent felt it would be less desirable as a place to live and raise a family. Equally strong



responses were given in a subsequent survey when individuals were asked about Las Vegas as a place to attend a convention, visit as a tourist, raise a family, retire, etc. These respondents were asked about their potential behavior first without any reference to a repository and then a second time after being told a repository would be located 90 miles to the northwest. For all of the activities identified, the repository significantly reduced the numbers of people rating Las Vegas favorably for these activities and increased the numbers rating it unfavorably. Moreover, there was an increase in the number of people who said a repository within 90 miles would make Las Vegas totally unacceptable for any of these activities.

Interpretation of these results presents difficulties since the proposed repository is not yet well enough defined or understood to ensure that respondents could accurately predict how they would react to it. So while the issue of future behavior is necessarily unresolved, the surveys do record intense negative attitudes toward the repository at the current time. These attitudes may not predict future behavior but they indicate the direction that future actions may take. Given the inherent limitations of working with the answers to these hypothetical questions, it was critical to use other methods to better understand how risk-induced attitudes and perceptions might affect behavior.

One alternative approach to understanding the relationship between risk and behavior was to conduct "Image Studies" on the characteristics of Nevada, Las Vegas, and radioactive waste. This involved a research effort that dealt directly with perception and behavior. The approach was based on the hypothesis that people have images or stereotypes of places and that the positive or negative dimensions of these images influence behavior toward the places. To many people this will seem obvious since considerable effort in advertising products, services, and places is based upon just this premise.

The underlying hypothesis was tested in a pilot study of Phoenix households and demonstrated to be valid. People have images of places, and positive imagery is a very good predictor of their stated preference of a place to vacation, live, or start a business. People's imagery also predicts their actual, historical visitation behavior. This is not very startling. It just says that if you ask a group for spontaneous images they associate with cities A and B and then have them value the images, those with more positive images of A will indicate a preference for A if asked to choose a future vacation site and, in fact, will have visited A more frequently in the past.

The research program also explored the imagery of the repository and found it to be overwhelmingly negative. The most frequent associations were dangerousness and death and their synonyms, followed by pollution, radiation, and other negative concepts. It follows that if the repository were to become associated with Las Vegas or Nevada in the eyes of the general public, there exists real potential for a decrease in tourism, immigration, and economic development.

Perhaps most relevant, Nevada is already associated with nuclear imagery. About 10 percent of the Phoenix sample used nuclear, radiation, bombs, etc. as one of the first six images they associate with Nevada. This group had a decidedly more negative image

of Nevada than the remainder of the sample, had visited Nevada less, and were less willing to visit Nevada in the future. Las Vegas, on the other hand, was conspicuously absent of nuclear imagery. This distinction on the part of people's perceptions and behavior is interesting and may imply either a fundamental separation of the image associations for Nevada and Las Vegas or some limitation in the current study methodology. Further research is indicated and is planned for the upcoming phases of the study.

The conclusion of the research to date is that Nevada faces considerable exposure with respect to risk-induced effects. Given the uncertainties associated with how the repository program and its consequences will be perceived, and about the way in which people will react to repository-related perceptions, Nevada must be alert to the possibility that these effects could be very negative and could be large.

The size of these potential negative effects has not been determined yet, and the subject remains under study. It should be noted, however, that each one-percent decline for Clark County in spending by visitors, retired people, and investors relative to the baseline levels assumed to occur in some future year (e.g., 2010) could produce an annual loss of 7,000 jobs and \$200 million in income. It is not clear how large a percentage decline could be expected as a result of repository-related perceptions, nor how long it would last, but corresponding cases involving risk-related declines in tourist spending indicate that such decline could be well in excess of the conservative one-percent illustrated here. Further research into analogous cases is planned to test these assumptions.

Although the numbers generated by the one-percent scenario above are large in absolute terms, they should be seen in the context of expected growth in the Clark County economy. By 2010, the Clark County economy is expected to grow by 60 percent. Impacts of the magnitude represented in the scenario would be modest relative to the size of the overall economy. However, the magnitude of potential impacts could be greater in both relative and absolute terms if current growth projections for Clark County are not realized or if the special effects exceed those shown in the one-percent scenario.

The emphasis for continuing research will be on better understanding the relationship of the repository to perception and behavior. The imagery research will be expanded to include a representative national sample. The process of image formation will be studied to better understand the current place of things nuclear in the imagery associated with Nevada and to anticipate how that might change in the future. Attempts will be made to understand the duration of risk-induced effects. Under what conditions will stigmatization be lasting? Under what conditions will it be transitory?

#### **OVERALL CONCLUSIONS BASED ON WORK COMPLETED TO DATE**

The greatest potential socioeconomic difficulty of the proposed repository stems from the intense negative imagery associated by the public with a high-level radioactive waste repository, combined with the vulnerability of the Nevada economy to changes in its public image. Because of the high profile nature of the whole nuclear waste disposal

program, the potential exists for Nevada to become associated with this negative imagery to the detriment of its attempts to attract tourists, conventions, migrants, and diversified new industry to the state.

A portion of the research effort reported here has been devoted to measuring the intensity of people's current perceptions and to better understanding how imagery affects intended future behavior. The conclusions of the work to date are:

- the repository's image is very negative;
- the nuclear imagery of the repository could become associated with the State of Nevada; and
- a more negative image of the state could have substantial adverse effects on key Nevada industries.

Looking to the more conventional economic dimensions of the project, the proposed facility would provide an economic stimulus to the Nevada economy with total annual employment effects of about 3,000 to 4,000 jobs during the period the repository would be accepting waste. Associated population impacts would be 6,000 to 7,000 persons.

Economic growth and diversification are viewed positively in Nevada. However, one result of the current tax structure is that public services and facilities are already under stress. The additional repository-related population growth will generate substantial negative fiscal impacts for state and local jurisdictions. Although such negative fiscal impacts would result for any non-gaming industry economic development, there is a distinction between the state's willingness to subsidize desired economic diversification and its willingness to subsidize the fiscal effects of a repository. The goal of economic diversification programs in Nevada is to reduce the risk of economic losses in the event of a down turn in the state's all important tourism industry. A repository could enhance the risk to this very industry through the mechanism of risk perception and risk-related behavior. Thus the repository may not be considered attractive from an economic development standpoint because it has the potential to bring about precisely the opposite effects on the economy from other forms of development.

The issues and concerns expressed by many residents of Southern Nevada make it clear that there is wide-spread opposition to the repository based on health and safety concerns (especially in regard to transportation), the potential threats to the economy, the creation of divisive policy issues, and the fear of diminished quality of life. Native American residents consider the repository program as a threat to their cultural values and to their hopes to regain traditional lands.

Although the standard effects create challenges for monitoring and mitigation, they do not raise the same level of concern as the special effects. This is because the mechanisms by which the standard effects are transmitted are better understood and

there is a reasonable level of confidence that their negative impacts can be managed effectively.

The special effects create much greater concerns because less is known about how they work and there is no basis to argue conclusively that they could be reversed once set in motion. A primary conclusion of this research is that the State of Nevada cannot afford to ignore these risk-induced effects on its economy and society.

The results of the many different research efforts indicate that state and local governments must work under the assumption that the high-level radioactive waste repository proposed at Yucca Mountain has the potential to result in significant negative impacts for the state's economic base, revenues, public services, and community life. Such impacts could more than offset any expected benefits to be derived from employment and income generated by the project.

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