

THE RELATION OF EQUITY ISSUES TO RISK PERCEPTIONS AND SOCIOECONOMIC IMPACTS OF A HIGH LEVEL WASTE REPOSITORY

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ABSTRACT

Equity concerns are an important component of the debate on controversial public policy decisions. In science policy, concepts of fairness need to be applied to what counts as evidence, as well as to process (means) and outcomes (ends). A science policy decision that involves technologies perceived as risky may have a better chance of enduring over time if all the key parties feel that they have been fairly treated. One task of risk communication is to engage in a dialogue with affected parties and the public about what is fair in terms of process, evidence, and outcomes. The high-level waste debate since 1982 provides a rich example of the relevance of equity considerations in science policy.

EQUITY CONSIDERATIONS IN SCIENCE POLICY (1)

Equity concerns have always been an important component of the debate on controversial public policy decisions. People are prone to react negatively if they feel they have been unfairly treated, and can become quite hostile if they believe they have been "screwed," either in the process leading up to a decision or in the outcome. In some cases, people are willing to accept an outcome that they do not like if the process itself is perceived as fair. And people disagree about what is equitable. Standards of fairness have evolved over time; sometimes there is a societal norm or consensus that clearly determines what is fair or unfair. In many specific situations, however, there are no widely accepted norms of fairness to provide clear guidance -- the democratic process, the Constitution, and the courts are used as arbiters in these situations. A person's view of what is fair in a specific situation is affected both by that person's application of certain normative principles and by his or her own special interests. Procedural fairness refers to concerns about a fair process; distributional fairness refers to concerns about a fair outcome.

Public policy decisions that involve significant inputs of scientific and technical information, like decisions concerning the high-level waste repository, fall under the rubric of science policy. In science policy, concepts of fairness need to be applied to what counts as evidence, as well as to process and outcomes. The key issue is what type and degree of scientific evidence is sufficient and admissible in making a particular decision for society, especially when there are large unknowns and uncertainties, and debate among experts. Alternatively, how do we fairly assess and arbitrate different interpretations of the state of scientific knowledge in making a policy decision that will affect people. Value judgements are involved in making these decisions about evidence, and have been called evidential value issues.(2) An example that manifestly illustrates the role of value judgements in questions of scientific evidence is new drug development. How sure do we have to be about both the positive and negative effects of a new drug before it is licensed for use? If standards of proof on the positive side are too strict, society may forego beneficial drugs that can help some people; if standards are too lax on the

negative side, some people will be harmed. Another evidential issue that involves value judgements is the question of how sure do we have to be that the high-level waste repository will be safe before granting it a construction license. Where to set these standards of proof -- how certain do we have to be -- are value judgements.

When the science is complex and uncertain, politicians will focus on process to ensure that objective analysis and fair assessments are done. During the debate on the Nuclear Waste Policy Act (NWPA) of 1982, Governor Riley of South Carolina clearly made that point. He stated: "A process of decision-making must be established that will allow us to have confidence in the results of that process. There will be remaining uncertainties no matter what the decisions are. Only confidence in the process which leads to those decisions will enable us, as a society, to live with those remaining uncertainties."(3) Emphasis on a fair process for arbitrating evidential value disputes is necessary, but not sufficient. Also required is an appreciation of the limits of science, because science policy decisions often deal in realms that Alvin Weinberg has called "trans-science."(4) Some of the uncertainties in scientific knowledge may be irreducible in the short run, some may be irreducible in the long run; but decisions have to be made. No action is itself a decision that will affect people.

Although it is only a conjecture, a science policy decision in a controversial area may have a better chance of enduring over time -- "sticking" -- if all the key parties feel that they have been fairly treated. High-level waste policy decisions have certainly not "stuck" for long; consensus has come unglued and policies dramatically changed. Parties that lose at one stage, feeling unfairly treated, often continue fighting until the policy is overturned. This conjecture is a reflection about the current state of our participatory democracy in the U.S. But this situation has not always been the case. There are many examples historically where the elected political leadership, or the people to whom power has been delegated, have made key decisions internally, in a closed rather than an open manner, and then imposed the decision successfully. Weak constituencies have been overcome by sheer political force; so that even if those constituencies feel unfairly treated, they are unable to do much about it. Public demands for more open decision-making have made it less likely that the more authoritarian

democratic approach will work, especially in areas where the public perceives significant risk to things they value.

Some successes in the more open approach may be occurring in the siting of low-level radioactive waste disposal facilities. In Illinois, the siting agency and contractor have focused on volunteer communities (those receptive to consideration of being a host for the facility) and proposals for granting the host community additional safeguards and power, as well as incentives and compensation. The approach in Illinois has been successful so far. The state agency has adopted the design goal of zero release for the contractor's engineered containment facility, the host community may be given certain rights to ensure the facility will be shut down if it does not operate properly, and the host community will receive considerable benefits. This siting policy addresses fairness in process, evidence, and outcomes. Transferability of the low-level waste experience to high-level waste is debatable. Each issue has its own set of special circumstances -- "the devil is in the details" -- but fairness concerns always need to be addressed.

One task of risk communication, an outgrowth of the previous conjecture, is to engage in a dialogue with all the affected parties and the public about what is fair in terms of process, evidence, and outcomes. In other words, appropriate topics for discussion are the questions of how do we ensure a fair decision process, how do we fairly evaluate the scientific evidence, and how do we minimize and compensate for inequitable outcomes.

FAIRNESS AND THE HIGH-LEVEL WASTE DEBATE

Fairness issues have come up frequently in the high-level waste debate, as illustrated below for several time periods, beginning with passage of the NWPAA in 1982. NWPAA Era (1982-1987)

The NWPAA era emphasized procedural fairness, both in intergovernmental relations and in evidential aspects. On intergovernmental relations, the act provided to a potential host state or Indian tribe the right of "consultation and cooperation," as well as the right to issue a notice of disapproval (which could be overridden only by Congress). On evidential aspects, the regulatory framework provided for licensing by an independent regulatory agency, the Nuclear Regulatory Commission (NRC), implementing standards set by the Environmental Protection Agency (EPA) and the NRC, to determine "how sure is sure enough." The siting approach utilized for the repository required multiple sites under investigation and comparison between them, and one of the tools adopted by the Department of Energy (DOE) for aiding in selecting sites for characterization was the formal methodology known as multiattribute utility analysis.

Distributional fairness concerns also surfaced in the NWPAA, as shown in the provisions for: two repositories, with one in the west and one in the east; the one mill per kilowatt-hour fee on nuclear electricity for funding the repository program, reflecting the "polluter pays" principle; and the sharing of repository costs between utilities and DOE defense programs. Fairness issues also emerged in the

decision to develop permanent disposal. Environmentalists viewed this approach -- solving the problem permanently -- as fairer to future generations. Utilities viewed the repository program as essential for their fair treatment, since the federal government had promised to take spent fuel, and to show the public that the waste problem was solvable, which otherwise would be a detriment to further nuclear power development. The tight schedule was seen as necessary to force the federal government to get on with the job.

Conflicts occurred during implementation of the act in part because tradeoffs in objectives were required, especially between fair process and efficient implementation. Distributional fairness encompasses being fair not only to individuals and groups, but to society as a whole -- the concept of efficiency that economists like to talk about. Some states felt that the federal agencies, particularly DOE, did not live up to the spirit of "consultation and cooperation." In their view, DOE generally chose in its discretionary actions to try to meet milestones rather than to slow down the program in order to accommodate more consultation with the states. The federal agencies, on the other hand, felt that they had a mandate to move forward expeditiously, pointing to the rigid timetable in the act. To DOE, the states sought to delay in order to throw obstacles in the way of the federal program. This distributional concern of being fair to the country overall through efficient and speedy implementation was given greater weight by DOE than bending over backwards to accommodate procedural equity concerns emphasized by the affected states.

Concerns about procedural, distributional, and evidential fairness had a role in the unravelling of the NWPAA. Critics claimed that DOE was being political rather than objective in its evidential decisions, such as in the selection of the three sites for characterization for the first repository and deferral of the second repository. Some felt that the NWPAA was itself fatally flawed, because a democratic political system could not withstand the distributional concerns of the politicians and the public that would obviously occur with many states under investigation for a repository.

NWPAA Era (1987 - 1990)

The selection of Nevada as the host state for characterizing a repository site was the *raison d'être* of the Nuclear Waste Policy Amendments Act (NWPAA) of 1987. Was that decision fair? Reasonable arguments can be marshalled to support either side. Some in Nevada think that the NWPAA was patently unfair on procedural, distributional, and evidential grounds. Their arguments might go as follows: Nevada did not consent to the decision (procedural fairness); the state already has the burden of the country's nuclear weapons test site and should not have to accept the burden for the repository because it has no commercial nuclear reactors (distributional fairness); and Congress made a political site selection decision, and the subsequent scientific process to evaluate the Yucca Mountain site will

be less objective because comparison of sites was abandoned (evidential fairness).

The majority in Congress apparently thought otherwise about the fairness of the approach taken in the NWPAA, or rationalized their vote because they were protecting their own special interest. Some arguments that might support the view that the NWPAA was fair include the following: we are a country of shared obligations -- other states also accept burdens for society, equity does not have to be exact on an issue by issue basis, and compensation for Nevada was added in the act; selecting Nevada provided considerable benefits to society in terms of less cost for the program and less political turmoil for the country; and the evidential guarantees were strengthened in the act through the addition of another technical review body, the Technical Review Board. The requirement that DOE would have to obtain a license from an independent regulatory authority was left unchanged. Nevertheless, the fact that Nevada's elected representatives did not consent is a powerful argument for those Nevadans who feel unfairly treated.

Another issue tackled in the NWPAA was that of the Monitored Retrievable Storage (MRS) facility. The MRS Review Commission was set up to be a fair way to make the evidential determination of whether or not the MRS is needed. The Commission has been very careful to ensure procedural fairness in its public forums to date. Being perceived as independent, open-minded, and objective (avoiding all appearance of conflict of interest) may be essential for maintaining credibility with the Congress and the public, and increasing the chances that the Commission's final report will be accepted by those whose views might be different.

Site Characterization and Licensing Era (1990's)

This stage may be the most difficult challenge of all, focusing on the evidential issue of how do we fairly evaluate the scientific evidence to ensure repository safety. What will science be able to tell us in the approximately five years of site characterization and three years of licensing review? The time frame for resolving the uncertainties with reasonable scientific assurance may be much longer than the time frame allowed in the current process, and may be impossible in the current regulatory framework. Proving with "reasonable expectation" that the EPA and NRC containment requirements and other licensing conditions will be met is an enormous and unprecedented challenge. My own view is that we may have to adopt a more exploratory and evolutionary approach for site characterization in order to avoid a failure of the program in the 1990's.(5)

Socioeconomic Impacts

Nevada has been conducting a socioeconomic impact assessment of the Yucca Mountain repository.(6) A key question is whether or not significant economic and other impacts on Nevada could result from the public's negative perceptions of nuclear waste and its risks. This is an evidential issue, but in social science rather than science. The

uncertainties here may be as large as the evidential issues in repository safety. How do we fairly assess the possibility of these potential negative socioeconomic impacts? Policy and management decisions will have to be made, even though some of the uncertainties may be irreducible a priori. When decisions have to be made under these circumstances, large uncertainties in the evidence, the fairest thing may be to design policies that are robust under uncertainty. The goal is to minimize the likelihood of large negative outcomes, perhaps sacrificing some positive benefits that might accrue under certain scenarios with a different policy decision. In the case of repository socioeconomic impacts, management policies that minimize chances of significant negative effects is the prudent course. One aspect is to make people feel that they have been treated fairly; it helps to build trust and credibility. Compensation alone is insufficient.

SUMMARY

Good risk communication policy requires engaging in a dialogue with the affected parties and the public concerning what is the fair thing to do in terms of process, outcomes, and evidence. In the case of the potential repository at Yucca Mountain, because some part of Nevada's population feels that it has been treated unfairly, the federal government might consider bending over backwards to be fair to Nevada in the next stages of the process. What society should do about radioactive waste pragmatically comes down to what is acceptable to society -- what will "stick" over time given the evidential uncertainties, perceptions of risk, and the contentious distributional debates. Policies that are widely perceived as fair may have a greater chance of surviving over time.

REFERENCES

1. This paper draws upon the author's research as part of a study on "ethical and value issues in radioactive waste management" supported by the National Science Foundation. Other researchers involved in the study are Mary English and David Dungan of the University of Tennessee and Sheldon Reaven of the State University of New York.
2. This phrase was coined by Sheldon Reaven.
3. Richard W. Riley, "Nuclear Waste and Governance," *The Politics of Nuclear Waste*, edited by E. W. Colglazier, 1982, p. x.
4. Alvin Weinberg, "Science and Its Benefits," *Hazards, Technology, and Fairness* (National Academy of Engineering), 1986, p 9-23.
5. E. W. Colglazier, "Rethinking the MRS: Public Policy Issues Surrounding Monitored Retrievable Storage of Spent Nuclear Fuel," *Waste Management '89*, Session IX, published in this volume.
6. The author is a member of the Technical Review Committee for the socioeconomic impact assessment being conducted for the Nevada Nuclear Waste Project Office.