STATE TECHNICAL REVIEW OF THE HLNW PROGRAM

AND THE PEER REVIEW PROCESS

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ABSTRACT

Millions of dollars are being spent on state governments' review of the Department of Energy (DOE) high level waste (HLW) repository program. A significant portion of the review efforts focus on technical issues surrounding the development and installment of HLW disposal technologies. Some view the states' technical review efforts as part of a peer review process. However, this interpretation reveals a misunderstanding of the concept of peer review and the purposes of state technical review.

PEER REVIEW DEFINED

Models of the peer review process can be found in the procedures used to review manuscripts submitted to technical journals or to review research proposals submitted to the National Science Foundation (NSF). Ideally, peer review attempts to separate the scientific from the ideological, the objective evaluation from the subjective one. The submittal's social, economic, and political impact or usefulness are not prime criteria of the evaluation. Peer review is assumed to evaluate work on the basis of its conceptual clarity, rules of logic and evidence, and the rationality of its research design. Such an evaluation assumes that reviewers have access to explicit descriptions of original data and methods sufficient for replication of the study results. Inherent is the assumption that errors in scientific work subject to peer review will be corrected and that given the same evidence rational people will reach the same conclusions.

Like all ideals it is seldom achieved in practice. This idealistic model of scientific peer review survives in academic settings but compromises are inherent in its application. Plans for objective peer review of the HLW program data should recognize that approximating this ideal is difficult enough in the ivory tower (where the conflicts can be so bitter because the stakes are so small), let alone in the political arena where the stakes are so high.

REVIEW BY PEERS

What does it mean to propose that technical review be part of a PEER review process? Who are the peers? Unlike the ideal model of peer review, technical review of the HLW repository program is organized such that state reviewers and those submitting materials for review (i.e. the DOE) do notfunction as peers. The state role is constrained by administrative and political factors. For example, the DOE has attempted to limit outside studies commissioned by the states, thus foreclosing the opportunity for replication. Unlike large, stable research institutions funding uncertainties can make it difficult for states to maintain experienced review staffs. Reviewers must examine the products of highly specialized professions. The supply of such expertise is limited and access to it is further constricted by the desire of states and contractors to avoid the conflicts of interest that would arise in advising both state review programs and the DOE. As is true in other environmental impact assessments, the emphasis of states' technical review comments may reflect the availability of resident expertise. In other words, technical review may reflect a realistic approach in which "we review what we know about and have to forget about the rest."

In what would have to be any author's dream, and unlike existing models of peer review, the rules are set by the "reviewee" (the DOE) who decides what, when, and how technical reviews will be conducted. The subordinate position of states to the federal government in certain matters (e.g. the interstate commerce in spent fuel) reinforces the power disparities which remove the possibility of a review by peers.

PEER REVIEW: THE MYTH OF CONVERGENCE

For some, peer review may be a desirable model for the technical review program. It serves the expectation that once they have an understanding of the facts all participants can eventually share the same interpretation of the problem and its solution, based on common norms of what is "good scientific or engineering practice." This assumption underlies many communication and public relations programs and can be called the "assumption of convergence." However, even within working peer review processes, such as the NSF, convergence is not assured. A 1981 study by the National Academy of Sciences of the NSF peer review process found that "...evaluation of even the best science is not a matter of consensus and certainty. Deep seated differences in approach and methodology are present in almost all fields, and evaluations can be expected to differ in many the same ways research priorities differ...Differing evaluations of the same proposals by peer reviewers are therefore very common."[1] Convergence cannot take place because no common normative system operates within science. Definitions of "good scientific practice", sufficient data, and appropriate methods are not shared among scientists from different fields or even by those within the same field. Conflict arises within the technical review program over which set of norms to apply.

Defining an "understanding of the facts" is thus the construct of a group that shares a set of standards. Convergence only occurs when groups abandon their own view and are assimilated into a single peer group's perspective-- an unlikely event in situations already characterized by conflict.

PEER REVIEW AND MANAGERIAL SCIENCE

States are not reviewing the work of scientists whose primary goal is to advance knowledge and an academic discipline-- the topic of model peer review processes. They are reviewing the products of what some authors have called "managerial science."[2] The goal of managerial science is to solve a problem, in this case HLW disposal via implementation of the Nuclear Waste Policy Act (NWPA). The amount and quality of managerial science and research is not controlled by the norms of the scientific community but by policy implementers and their definition of the problem and what information is necessary to produce a solution. Thus solutions, and consequently data collection and analysis, are driven by political priorities and constrained by administrative decisions. In managerial science the definition of enough data can only partly be determined by scientific considerations. Conflict in technical review over the adequacy of existing data originates in conflicting interpretations of policies, goals, and definitions of the problem to be solved.

THE NWPA AND THE PURPOSE OF PEER REVIEW

The NWPA [Sec. 116(c)] requires that grants be made to candidate states for review of DOE activities to determine the potential economic, social, public health and safety, and environmental impacts of a repository on the states and their residents. Additional purposes stated in the Act include using such reviews to develop impact assistance requests, to provide information to state residents, and to engage in monitoring, testing and evaluation of site characterization activities. Technical review is thus funded to support state government's responsibility to protect the health and well-being of its citizens.

Definitions of "well-being" are of course political. An interest group can convince government to promote clean, healthy air; scientific research provides information on the biological costs and benefits of various levels of pollution. Its findings may then be used to promote a certain standard of clean air. But scientists cannot determine what level of pollution is (un)desirable-- i.e. define "healthy air." That determination, like the determination of what is a "safe" repository, is the outcome of a political process in which society attempts to balance concerns for physical as well as social and economic well-being. Similarly, the NWPA anticipates that the states will use the results of their technical programs to identify those repository program impacts they view as unacceptable. This is far removed from a model of peer review in which economic, social, or political considerations are supposedly irrelevant.

As suggested by the NWPA, the purpose of technical review (unlike the "correction function" of peer review) is not so much to correct the technical details of DOE research and development but to identify those aspects of the HLW program which threaten state and local well-being. As has already been discussed, states cannot conduct thorough reviews of all the technical aspects of HLW R&D. And, it appears that Congress never envisioned that the states would assume such a role; therefore, it is erroneous to assume that lack of state comment on certain technical results implies endorsement of their validity and accuracy.

In contrast to peer review, the political nature of technical review is more obvious, especially when one considers the context of its day to day functioning. Just as there is no assurance of consensus among peer reviewers, the state technical review programs operate in a context of conflicting norms and evaluations of the HLW program. Review programs have had to confront groups who would prefer that the state actively solicit repository development as well as groups opposing such a facility; those who prefer to concentrate on procedural instead of technical issues as well as those who prefer to emphasize some technical issues to the exclusion of others; those that would use HLW as a campaign issue as well as those who wish reviewers would go into hiding until after the next election.

The conclusions of a technical review will be supported by scientific evidence and arguments. But in the final cut those conclusions will be tailored to reflect compromises and the response of state governments to the needs and demands of their citizens.

AUTHORITY AND UNCERTAINTY

The current HLW technical review program is a good example of the tension that can exist between the use of science to lend authority to policy objectives or to express the (un)certainty of current knowledge. Scientific knowledge can be used to lend authority to predictions about the repository site's climate 10,000 years from now; or it can be used to discredit the reliability of such predictions. The authoritative approach emphasizes the finality of predictions and views the possibility of error as insignificant. However, it may be impossible for state reviewers to produce alternative predictions even if they disagree with the authoritative prediction. But an alternative approach can be adopted in which states will concentrate on demonstrating the uncertainties and potential errors in existing knowledge and predictions. This emphasis on identifying the uncertainties reflects a model of technical review suggested by C.S. Holling-- adaptive environmental assessment and management.[3]

Holling's approach a) replaces the dependence on authoritative data and predictions (which he sees as virtually impossible in complex systems such as ecosystems) with the creation of project management programs responsive to unexpected events and impacts; b) considers that all environmental impacts cannot be predicted and that mechanisms for responding to unanticipated impacts be built into the design process; c) recognizes that there is "no guarantee that in a scientific study the appropriate variables or processes will be measured." In short, Holling is suggesting that even the most careful research and design will overlook serious impacts and problems. Technical review thus has the important function of identifying uncertainties rather than endorsing expertise or modifying authoritative data and predictions.

CONCLUSION

To summarize: State reviewers do not operate as peers with the DOE in a peer review process; peer review or technical review will not necessarily lead to convergence on the standards of good scientific practice. And, unlike peer review processes, technical review was envisioned by Congress in the NWPA as serving the political purposes of protecting the interests and well-being of state and local peoples impacted by repository program developments. Technical review fulfills the valuable function of criticizing and probing the reliability and uncertainties inherent in program data.

Compared with models found in the scientific community, state technical review programs cannot operate as part of a peer review process. And given the

political and normative constraints and contexts in which state technical review takes place it appears unfounded to expect the states to fulfill such a role. Technical review at the state level will continue to serve important purposes apart from correcting errors in the DOE HLW repository program.

REFERENCES

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