Who should decide the complex question of radioactive waste disposal? The authors argue that citizen participation is desirable and practicable.

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The public and technological decisions

Channels have always been available through which powerful individuals and organizations demand and achieve influence over government decision-making in areas affecting their interests. Now that large numbers of people are literate and the mass media inform and connect them, they too are capable of becoming organized and therefore powerful when the right issue arises. Governing may become more difficult as the number of vocal interests increases, but there is no doubt that, at least in some cases, public action has saved us from some technological Vietnams—the anti-ballistic missile and the supersonic transport are pertinent examples.

Public participation serves two purposes. It confers political legitimacy on the policy that results; and it may produce a better policy as a direct result of that participation. The standard model of proper public participation in government policy-making is one that we term the "public comment" model. This is exemplified by the National Environmental Policy Act process. Under the National Environmental Policy Act, government agencies are required to produce an Environmental Impact Statement summarizing the environmental effects of a particular decision that they are planning to make, and indicating why they prefer that choice over a number of other alternatives that are also considered in some detail in the report. The Environmental Impact Statement is circulated for comment both within the government and from the general public for a certain number of weeks, and then, on the basis of these comments, a revised report is generally produced. The revision is presumed to reflect the public comments, and thus the conclusion supported by this new report is considered to be based on public participation.

Although the National Environmental Policy Act process is an improvement over what came before it—which was very little public participation at all in most decisions—we do not think that this "public comment" process is an adequate model of public participation. Nowhere are its shortcomings more evident than in the current controversy over the disposal of radioactive waste. This controversy is not simply a matter of choosing among possible technologies. It involves serious doubt—if not suspicion—about the government's intentions and competence.

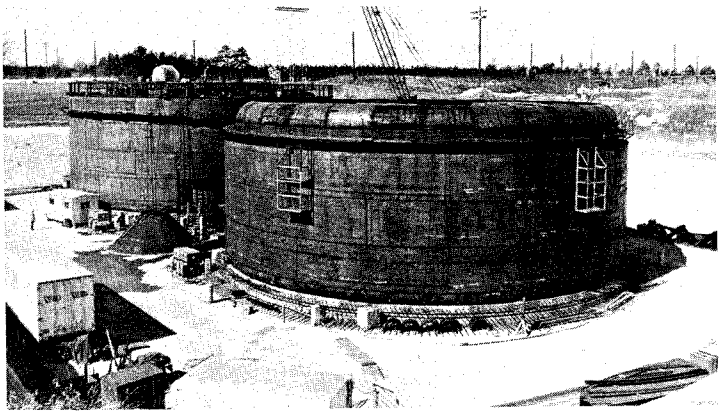
After a brief look at the main problems of public participation in this debate, we shall propose a new model which we call "critical review and public assessment"—a two-tiered approach to public participation. This model recognizes and takes advantage of a fact already well documented: that time and again in public controversies over technologies, independent scientists have been the first to raise the issues and suggest possible responses, after which public activists, elected officials and government agencies grasped the problems and took over.[1] The public cannot respond directly to enormous and vague technical issues before that groundwork is laid. We will then place our proposal in a larger political context.

Current federal approaches to public participation. The Nuclear Regulatory Commission (NRC), the Department of Energy (DOE) and the Environmental Protection Administration (EPA) all have responsibilities in the area of nuclear waste management. The seven-pound draft Environmental Impact Statement on Radioactive Waste[2] released for comment by DOE in April 1979 lists hundreds of options, and options within options, but nowhere is any indication given of exactly what they would do with the waste. All three agencies recognize a need for public participation (in some cases because it was written into their authorizing legislation) and have held either public workshops or hearings on the radioactive waste issue.

The first questions participants of EPA's Albuquerque workshop were supposed to consider were:

- If EPA addresses unplanned events in its environmental protection critieria, what would be an appropriate and effective approach?
- What aspects of the disposal process and of the unplanned events should be addressed?[3]

No one can answer questions like these. And the NRC workshops for state representatives were similarly frustrating, since it became clear to all concerned that the Nuclear Regulation Commission's main purpose in holding the workshops was mere information exchange; no sharing of decision-making power was contemplated.[4] The Department of Energy has held public hearings on its gigantic Environmental Impact Statement, but as Abrams dis-



'No one—not the public, not the agencies, not Congress, not even the nuclear industry—knows what a real waste disposal plan might look like.' (right) Storage tanks in South Carolina.

covered while testifying at the San Francisco hearing, the Department did not even have the courtesy to send its own employees to conduct the hearing. Instead, outside consultants with unspecified, if any, connections to DOE policy-making had been hired for the purpose.

Genuine public participation is not to be a sop or a sugar-coating. Rather, it is a delicate kind of communication, formal yet meaningful, translating emotions and values into constructive proposals. Like any such communication, it is an art both to do it and to hear it. It cannot be slipped into a rigid decision-making process without sounding like an angry trumpeter interrupting a string quartet. In sum, DOE hearings, EPA and NRC public workshops, and NRC practice indicate both that:

- these agencies have never thought through which of the decisions that they must make are the ones on which public participation is essential or feasible and which decisions may be reviewed and criticized by outside experts alone;[5]
- the agencies permit public participation either too early, when plans are extremely vague, or too late, when the public is presented with a *fait accompli.* Public participation is not integrated into the decision-making process and is thus generally viewed as a sham.

Critical review and public assessment. The fundamental flaw in the way the United States is going about the nuclear waste disposal decision is that *no one sees the big picture.* No one—not the public, not the agencies, not Congress, not even the nuclear industry—knows what a real waste disposal plan might look like. There is as little to defend as there is to criticize. But there is a solution to this problem.

In Sweden in 1977 the utilities were required by law to prepare a plan for nuclear waste disposal before they could open any new reactors. The plan they presented laid out a complete scenario of all the steps—from the time that the spent fuel rods were removed from the reactors through each stage of storage, transportation, reprocessing, burial. It then predicted long-term behavior of the waste forms for thousands of years. The Swedish government then commissioned approximately 50 reviews, by foreign as well as domestic experts and organizations. In addition, the government had its own Energy Commission, a politically appointed body with limited lifespan, perform an extraordinary technical review according to a new procedure called "scientific mediation" which Nancy Abrams and R. Stephen Berry had developed a year earlier.[6] (Abrams served as a consultant to the Swedish Energy Commission during the entire review.)

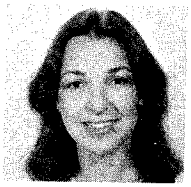
There were enormous problems with so complex a plan, and many were discovered by the various reviewers. With the piecemeal planning happening now in the United States such problems might never be uncovered. The great value of preparing the Swedish plan and having it reviewed independently by so many organizations and individuals was that Sweden got a real sense not only of the main problems in nuclear waste disposal but also of the big picture.[7] Ironically, the United States, with the largest quantity of nuclear waste in the world, has not even attempted an exercise on the scale of the Swedish effort. It can and it should.

A single overall nuclear waste management and disposal plan should be designed, containing a complete scenario for the fuel rods from the reactor to the waste forms thousands of years from now. The scenario should be understandable and visualizable, not a list of options. However, unlike the Swedish plan, it should also contain:

- an explanation of the reasons behind the main technological choices and
- unvarnished worst case analyses.

This plan, representing the best thinking of its makers, should then be published and opened for scrutiny. Numerous independent critical reviews should be funded by the government, which would ensure that the plan became a focus of national and international scientific interest as well as public debate. This plan would be the nation's first draft, and it is always easier to rewrite a draft than to start from scratch.

Who should prepare it? The Department of Energy could, of course, do it. In Sweden, however, the utilities prepared it and the government reviewed it. This may be a very good idea for us, too. If American utilities want to continue building and operating nuclear power plants, they should be able to provide a plan for nuclear waste disposal. The ad-



Nancy E. Abrams, a lawyer living in Santa Cruz, California, is working on developing new procedures for democratic resolution of technological problems.

vantages of this approach would be:

• *Public support.* There is already considerable enthusiasm for imposing such a condition on the utilities, both in the Congress and at the state and grassroots level.

• *Payment by the utilities.* Under current plans the utilities will be charged for a nuclear waste depository DOE is assigned to develop. But given the notorious tendencies of the federal government toward cost overruns and inefficiencies of every kind, it would be in the interest of the utilities to develop the first plan themselves, and they might welcome the challenge.

• *No jurisdictional problems.* Unlike EPA, DOE, NRC and other government agencies, the utilities are not limited in their planning capacity by jurisdictional divisions. They may therefore be in a much better position than the government to prepare a complete scenario now.

• *Government review.* Government agencies are incomparably better at regulating industry than at regulating each other. The chances are much greater that NRC or its successor agency will exercise critical judgment over a utility plan than over a DOE plan.

At least one of the independent critical reviews, to be sponsored by the White House or, as in Sweden, by an independent commission, should be performed according to the procedure of scientific mediation, since this is the only procedure specifically designed to bring out the real trade-offs, both qualitative and quantitative, in such a technical plan.

The plan and reviews could then be discussed at a conference or series of conferences held in Washington, D.C. This would assure both attentive and sophisticated press coverage, and attendance by the largest number of relevant decision-makers.

The general understanding that would emerge from an effort of this kind is an absolute prerequisite not only to the development of a safe long-range plan but also to any kind of meaningful public participation. The next version of the plan—which must be foreseen from the start—would likely be of incomparably higher quality, whether performed by the utilities again or the Department of Energy, depending on the law. This open review process, by raising fundamental issues and articulating a range of possible policy responses, would be a far better education and preparation of the public for participation in the actual decisions than the kinds of attempts we have seen so far from the federal agencies.

"Critical review and public assessment" is perhaps an awkward term. But the model it describes relates the concepts in a very particular way. There are two central principles that this procedure recognizes:

• Most members of the general public, however concerned, cannot respond directly to a technical plan of the kind we are proposing that the utilities prepare, let alone to the shopping list of the Department of Energy's Environmental Impact Statement. People need to see the problems and issues that would arise in actually designing a plan discussed critically by experts they trust. For some, that means public interest group experts; for others, industry experts; for still others, government or university experts. An agency seeking genuine public participation therefore must *first* seek and fund comment and analysis from all these kinds of experts, both interested and independent, and allow this stage of criticism to establish at least some of the issues for the public. The total resources devoted to the reviews should be approximately equal to the amount spent on preparation of the initial plan, and the reviews must be expected to become serious contributions to the plan's next revision.

• If the first plan is prepared as a draft, *not* as an adversary position to be defended at all costs, then the reviews can be constructive rather than merely political. The process of arriving at a truly adequate nuclear waste disposal program can thus be one of scientific and political convergence, rather than confrontation.

The larger political context. We have chosen to discuss our "critical review and public assessment" model in connection with the nuclear waste issue, not only because this issue is especially suitable, but also because we are concerned that this is a problem that must be solved in the next few years if it is to be solved at all.

Nuclear waste has been accumulating for three decades. Why is it critical that something be done about it now? From the viewpoint of the nuclear industry, obtaining a politically acceptable solution to the nuclear waste problem is one of the principal stumbling blocks to economic recovery. Taking cancellations into account, the net number of orders placed for new reactors in the United States in the past seven years is zero. If new orders cannot be obtained soon, one or more—indeed, possibly all four—of the U.S. reactor manufacturers will go out of this business.

If nuclear power is widely perceived as a dying technology, the interest of the public as well as the scientific community will shift to problems that are seen as more pressing. Radioactive wastes, like the tons of other toxic wastes that litter the country, will be left to be taken

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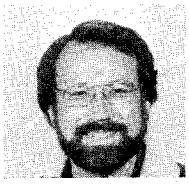

care of whenever, and if ever, someone has the time. If, on the other hand, there is a resurgence of the nuclear industry, it will no doubt occur under crisis conditions, when the concepts of public participation and protection of future generations will be sacrificed to the demands and fears of the moment. Thus it would appear that the only time for finding a safe long-term solution is now.

The pressure for developing such a solution has and must continue to come from people outside the nuclear industry and its related government agencies. But the channels for exerting such pressures, let alone for effectively injecting new ideas or concerns into the controversy, are practically nil. Frankly discounting any value in "public workshops," environmentalists, state governments and others have found only one opportunity other than public demonstrations—namely, to appear as intervenors in agency proceedings. Intervenors, however, are usually restricted to raising only those issues which the law already empowers or requires the agency to take into account in its decision. Furthermore, much of the hard-to-raise money spent by the intervenors goes not to development of better technological alternatives, but to lawyers who must fight stylized legal battles at a stage in the decision-making process when, as we have seen, the agency decision is often essentially a foregone conclusion and the only opportunity left for intervenors is to delay. Consequently, they are regarded by the agencies before which they appear, their industrial opponents, and the Congressional allies of those opponents as obstructionists; their long-standing efforts to obtain "intervenor funding" from the government have been, as a result, largely unsuccessful.

We must devise new procedures for national policy-making that will allow the public interest groups not only to speak but to be heard.

We have argued for "critical review and public assessment" as a way of obtaining a high quality technical plan while preparing the public to participate effectively in the decision-making process. But it can also be viewed as an alternative strategy to intervention. Unlike intervention, it actually challenges a flawed decision-making process, and yet, ironically, it may arouse less objection for several reasons. First, money paid out by the relevant agency—or possibly through a separate agency set up specifically for this purpose—would go directly for constructive critical reviews, not to hire lawyers. Second, scientists representing many points of view would be funded, not just environmentalists. Third, raising new technical issues or problems, so difficult in agency hearings, would be encouraged as one of the main goals of the entire process. Finally, the use of "critical review and public assessment" would, in a relatively short time, substantially increase the number of scientists who contribute to public issues generally, broadening the base of the public interest science movement with beneficial results across the board for technology politics.

Our concern that public interest groups and independent scientists play a greater and more effective role in technology politics should perhaps be explained further. The traditional theory of government regulation assumes that the public interest, whatever it may be, emerges from the clash of special interests, aired before impartial regulators who make decisions within the legal processes of a democratically elected government.

An increasingly popular competing theory, however, holds that in addition to the special interest groups affected by any government decision there are millions of people who in the aggregate are just as seriously affected. But since the economic stake of any given individual in that class is small and its members are unorganized, they send no one to represent their position in regulatory proceedings. The regulators quite naturally understand and sympathize with the views of the people they deal with most often—that is, the spokesmen for the special interests. Consequently, according to this second theory, the implications of a government decision for the large numbers of unrepresented people, will not be taken into account unless they are vigorously articulated before government bodies. Public interest groups try to do this, and they also propose policy alternatives. These public interest groups are admittedly self-appointed, but they nevertheless are playing a crucial role in policy-making today.

Those who adhere to the traditional theory tend to believe that public interest groups have no standing—after all, who elected them? But this betrays a fundamental misunderstanding of the purpose of those groups.

The average citizen is concerned

about nuclear power, but there are many other concerns: food additives, the arms race, housing shortages, exploding gas tanks, consumer fraud, inflation and a thousand other problems of everyday life in a technological age. To be fully informed on every issue, one would have to give up every other activity of life, including sleep, and still never master them all. Public interest groups specialize. They spend full time mastering the issues in one chosen area, often with public financial support, and do their best to represent the public interest as they see it.

As partisans of the second theory of government regulation, we have tried to devise a process which allows all substantial interests to participate and encourages particularly the participation of independent scientists in public controversies over technology. Although we believe that members of the general public have a right to be heard on technological decisions that will deeply affect their lives, we also know from experience that very few of them can actually afford the time or effort to inform themselves and make themselves heard.

A force as powerful and pervasive as technology, if not controlled by politics, can control politics, and the results for democracy may be devastating. Consequently, we must devise new procedures for national policy-making that will allow the representatives we currently have—the public interest groups and the state governments—not only to speak, but to be *heard*. Our goal must be to present the central technological decisions of our times as the political decisions that they really are—issues to be decided not by technocrats in industry or government but rather through open political processes with the best wisdom all of us have to offer.□

1. Joel Primack and Frank von Hippel, *Advice and Dissent: Scientists in the Political Arena* (New York: Basic Books, 1974; New American Library, 1976).

2. Department of Energy, *Management of Commercially Generated Radioactive Waste,* Vols. 1 and 2, draft Environmental Impact Statement (DOE/EIS-0046-D).

3. *Proceedings: A Workshop of Policy and Technical Issues Pertinent to the Development of Environmental Protection Criteria for Radioactive Wastes,* Albuquerque, New Mexico, April 12–14, 1977, U.S. Environmental Protection Agency. Office of Radiation Programs. See also *Proceedings: A Workshop on Issues Pertinent to the Development of Environmental Protection Criteria for Radioactive Wastes,* Reston, Va., Feb. 3–5, 1977, and *Proceedings of a Public Forum on Environmental Protection Criteria for Radioactive Wastes,* March 30–April 1, 1978, Denver, Colo., U.S. Environmental Protection Agency, Office of Radiation Programs.

4. *Means for Improving State Participation in the Siting, Licensing, and Development of Federal Nuclear Waste Facilities: A Report to Congress,* U.S. Nuclear Regulatory Commission, Office of State Programs (March 1979), NUREG-0539.

5. For a breakdown of those decisions and an attempt to match the "publics" which should be involved in the particular decision, see, Joel R. Primack and Nancy E. Abrams, "Helping the Public Decide," *Environment* (April, 1980).

6. Nancy E. Abrams and R. Stephen Berry, "Mediation: a Better Alternative to the Science Court," *Bulletin of the Atomic Scientists* (April 1977).

Scientific mediation is a procedure for advising government agencies on the technical aspects of a policy question when scientists are apparently in disagreement on the scientific questions. Very briefly, two or more scientists, one representing each main technical viewpoint, are brought together and, with the help of a mediator, they write a joint paper explaining their areas of agreement, their areas of disagreement, and the reasons why they disagree on each point. The focus of the effort is on illuminating their grounds for disagreement rather than on arriving at consensus.

A more complete account of how scientific mediation was used in Sweden appears in Nancy E. Abrams, "Nuclear Politics in Sweden," *Environment* (May 1979).

7. For details on the Swedish events, see Dean Abrahamson, "Governments Fall as Consensus Gives Way to Debate," Thomas B. Johansson and Peter Steen, "What to Do with the Radioactive Waste?" and Wendy Barnaby, "First the Election and Then the Referendum" all in *Bulletin of the Atomic Scientists* (Nov. 1979); Nancy E. Abrams, "Nuclear Politics in Sweden," *Environment* (May 1979).