Natural Resources Defense Council, Inc.

917 15TH STREET, N.W.
WASHINGTON, D.C. 20005
202 737-5000

Western Office
2345 YALE STREET
PALO ALTO, CALIF. 94306
415 327-1080

New York Office
122 EAST 42ND STREET
NEW YORK, N.Y. 10017
212 949-0049

NRDC Statement

before the

SUBCOMMITTEE ON ENVIRONMENT AND ATMOSPHERE

of the

COMMITTEE ON SCIENCE AND TECHNOLOGY

U.S. House of Representatives

by

THOMAS B. COCHRAN

July 18, 1978

I appreciate the opportunity to testify before this committee on environmental aspects of nuclear waste management and disposal focusing on development of environmentally acceptable criteria. I will briefly sketch for you two approaches to the waste disposal problems. The first of these I favor. The second represents the course the Department of Energy (DOE) is following which I believe is a bad one. I will then outline where I believe it is urgent for the Congress to focus its attention and propose that this focus should be on waste disposal criteria. I will then offer three criteria of my own and explain why I believe they should be adopted. With this introduction, I first discuss what I feel is the proper approach to the waste disposal problem.

Let us set aside all subsidiary considerations and simply address the question, what is the most rational way to attack the radioactive waste disposal problem. In answer to this, I would propose the following four stage approach.

- First, the waste problem must be carefully defined. The focus here would be on the quality and quantity of the wastes. The former to define the biological hazard of the wastes and the latter to define the present and future logistic problems.
- Second, a definitive set of overall waste disposal criteria must be established. The overriding objective in establishing these criteria should be the protection of the present and future generations from the adverse effects of exposure to the ionizing radiation associated with the wastes. These should not be simply a set of

motherhood statements. Rather, extreme care should be taken to make them sufficiently restrictive to ensure that they are met only by adequate solutions. Defining these criteria or goals represents a societal decision which should be made with broadest public participation. The establishment should not be left up to the nuclear or geologic communities or even the scientific community. Thus, there is an obvious and essential role for Congress to play in overseeing the development of these criteria.

The term "criteria" can take on different meanings. One can actually consider a hierarchy of criteria. Once the broad but definitive overall criteria or goals are established the more technical criteria on regulatory guides would naturally follow. These might be site specific such as site selection criteria or might be criteria related to container design. If the overall criteria are sufficiently restrictive, the development of these secondary criteria logically could be left to the technical community.

- Third, an R & D program would have to be established in order to identify those disposal approaches which would meet the above criteria. As part of this R & D program, procedures and instrumentation would have to be developed and implemented to determine that the ultimate disposal approaches and sites will meet the criteria.
- Fourth, based upon the above R & D program, sites would be selected and the waste disposal demonstration

aspect would begin. By demonstration is meant proof that the selected sites will satisfy the criteria.

If the waste problem is to be solved properly, I suggest that the above approach must be followed. This is not the case for the approach taken by the Administration. In fact, the Administration appears to be proceeding backwards through the above stages.

This backwards approach is the result of the driving function that has shaped all recent radioactive waste policy decisions made by the Administration. This driving function is not to find a safe disposal technology. The driving function is a priority desire within the Administration to insure the survival of the commercial nuclear power option. The recent policy decisions have been little more than responses to the problems of the nuclear power industry. Moreover, there are good reasons to suggest that these policy decisions will only exacerbate the nuclear waste problems.

From the perspective of the nuclear industry there are four clearly identifiable nuclear waste problems. First, there is the problem arising from the recent California nuclear laws which require some sort of demonstration that the waste problem is solvable. Second, public service and utility commissions (PSCs and PUCs) are demanding that nuclear fuel cycle uncertainties be reduced and that the cost of nulcear waste management be determined. Third, the utilities are becoming constipated with waste -- the spent fuel storage problem. And finally, the Congress and the public are clamoring that the Administration

doesn't know what it's doing -- there doesn't exist a workable process for solving the waste problem.

What is the Administration's response to this? First, in response to the California problem the Administration is proposing a demonstration effort at the WIPP facility. Although the geologic community, at least here in the U.S., has all but abandoned salt and Carlsbad, the Administration proposes that the determination of whether salt is an appropriate medium and Carlsbad an appropriate site be adjudicated via the NRC licensing process. Second, in response to the PSCs and PUCs, the Administration is offering to take title to the waste for a fixed fee. Third, in response to the spent fuel storage problem the Administration is pushing hard for away-from-reactor (AFR) storage. AFR storage, of course, goes hand in hand with the government taking title to the fuel for a fixed fee. And lastly, in response to the criticism that the waste program is in shambles, the President has set in motion an interagency review of nuclear waste strategy. All of these Administration responses are not bad. All but the last, however, conflict with the approach I outlined previously, that is, the approach one would take if the overall objective is to protect future generations instead of the domestic nuclear power industry.

If the Administration continues to follow its present course this conflict between objectives will continue to get worse, in large measure because a severe logistics problem looms ahead.*/ To place this problem in perspective consider for a moment the nuclear waste committed by the roughly 200 GWe of

*/ See, for example, "Nuclear Waste: Too Much Too Soon" by Thomas B. Cochran and Arthur R. Tamplin, June 1, 1978.

nuclear power already on the books -- that is, plants licensed, under construction, ordered and publicly announced. During their thirty year lifetime they will produce enough high-level radioactive waste to fill two repositories using the DOE capacity figure of 100,000 tons of high level waste per 2000 acre repository. With the California Energy Commission figure of 35,000 tons/repository, our committed nuclear generating capacity will require six repositories. These numbers increase to three and nine repositories if we assume a nuclear commitment of 300 GWe by 2000.*/

In arguing for a breeder some nuclear industry spokesmen like to apply the term "prudent planning base" to uranium resource estimates. If "prudent planning" were applied equally to waste repositories we would be looking for the ninth repository. Instead the first site has yet to be identified. The situation is not quite this bad because the third (by DOE estimates) or ninth (by California estimates) repository will actually not be required for several decades. This little numbers game does, however, illustrate that a potentially severe logistics problem is ahead and the U.S. can ill afford another waste management failure.

This prospect of a severe logistics problem ahead

*/ Some nuclear industry spokesmen, for example Floyd Culler, President of the Electric Power Research Institute, have argued that about 400 GWe by 2000 reflects a minimum growth figure for the nuclear industry to survive.

is already leading policy makers to conclude that they must solve the radioactive waste problem, and do so soon. This, of course, is an invitation to mistakes. Geologic media sites will be chosen hastily. Assumptions concerning long term integrity will be made in the absence of confirmatory data. Corners will be cut to meet unrealistic deadlines. There is real danger that the Federal Government in the interest of salvaging nuclear power will continue repeating the same kinds of mistakes that led to the controversies over reactor safety and nuclear weapons proliferation. As noted above, we are already witnessing this in the recent waste policies. We are also seeing this in the approach the Government has taken toward establishing regulatory criteria for waste disposal.

As noted previously one would have presumed that first the problem would be carefully defined, next an overall definitive set of waste criteria would be established, then instrumentation would have to be developed to assure that the criteria are in fact being met, and finally, a demonstration to determine whether the geologic medium and site meet the criteria. Yet the Federal Government's present approach is just backwards in this regard. The geologic media of choice -- salt -- and the site -- yesterday it was Lyons, Kansas, today it is near Carlsbad, New Mexico -- were chosen first, and now the Nuclear Regulatory Commission (NRC) and the Environmental Protection Agency (EPA) are being asked to develop the criteria.

Moreover, as California Energy Commissioner Varanini has noted:

> Currently the entire [radioactive waste] program is being driven by the DOE [Department of Energy] target for a licensed repository for initial operations by 1985. This schedule and the DOE program place NRC and EPA in a policy dilemma. Activities of EPA and NRC being done in parallel are better done sequentially. EPA is developing waste repository environmental standards which in turn are to form a basis for NRC site selection and suitability criteria. In fact, though, NRC may issue its criteria before EPA has finished its standards. This circumstance coupled with the lack of large-scale testing before standards are set means that these EPA and NRC standards will likely change dramatically over time.*/

If one examines the past history of the NRC (AEC), one finds that the regulations and regulatory guides were prepared, as often as not, to support decisions already made. Likewise, environmental statements for nuclear waste facilities (e.g., the Barnwell Receiving and Storage Facility) were prepared to support decisions previously made rather than serve as adequate and honest environmental assessments. This past experience suggests that the waste criteria will be compromised to satisfy the choice of medium and site in order to respond to the pressure for licensing a repository as soon as possible. In the case of EPA, it's not that regulations are written to support decisions already made, rather it is a failure to draft adequate regulations, or a failure to come to grips with the biological hazards associated with the exposure to low level radiation.

*/ Emilio E. Varanini, Testimony before the Subcommittee on Nuclear Regulation, Senate Committee on Environment and Public Works on Nuclear Waste Management, Washington, D.C., April 4, 1978.

The EPA tends to support the status-quo more by inaction than by action.

Considerable attention already has been given to the criteria by EPA and NRC as evidenced by the documentation developed recently.*/ This effort consists primarily of review and assessment of the issues involved and the development of methodology as opposed to establishment of definitive criteria. Draft criteria, however, are presently being reviewed by interested parties within and outside these agencies, and these are cause for some alarm. These draft criteria represent hard evidence that mistakes of the past are being repeated with respect to high level radioactive waste disposal and the development of disposal criteria. The criteria that are being proposed are

*/ (a) USEPA,"Workshop on Issues Pertinent to the Development of Environmental Protection Criteria for Radioactive Wastes" ORP/CSD-77-1, Reston, Va. Feb. 5, 1977.
(b) USEPA, "Proceedings: A Workshop on Policy and Technical Issues Pertinent to the Development of Environmental Protection Criteria for Radioactive Wastes" ORP/CSD-77-2, Albuquerque, N.M., April 1977.
(c) "Report of Findings of the Peer Review of the Site Suitability Criteria for Geologic Disposal of High-Level Nuclear Waste."
(d) "Proposed Goals for Nuclear Waste Management".
(e) USNRC, "Determination of Performance Criteria for High-Level Solidified Nuclear Waste," NUREG-0279, July, 1977.
(f) USNRC, "Workshops for State Review of Site Suitability Criteria for High-Level Radioactive Waste Repositories" NUREG-0353.
(g) "Proceedings for Conference on Public Policy Issues in Nuclear Waste Management." Chicago, Ill. Oct. 1976. Mitre Corp., McLean, Virginia.
(h) "Selection Factors for Repositories of Solid, High-Level and Alpha Bearing Wastes in Geological Formations."
(i) USEPA, "Considerations of Environmental Protection Criteria for Radioactive Waste," Background Report for a Public Forum, March 30 - April 1, 1978, Denver, Colo., EPA Office of Radiation Programs, Washington, D.C. Feb. 1978.

ill-conceived, weak, and more likely designed to facilitate licensing of the waste repository proposed by DOE, than to protect the health of future generations. (And, as we have seen, DOE presently has its eye on protecting the nuclear industry rather than our progeny.)

These draft criteria are in some respects less stringent than those recommended in 1966 by a National Academy of Sciences (NAS) Committee on Geological Aspects of Radioactive Waste Disposal. It has not been lost on the NRC and EPA that DOE has already voiced its preference for the medium and site for the first high level radioactive waste repository -- salt and the WIPP facility near Carlsbad.

Consequently, I think it is imperative that the Congress focus its efforts on insuring that overall stringent restrictive criteria be established that place a priority on protecting the welfare of future generations rather than the nuclear industry. I am naturally very pleased that this subcommittee has taken the initiative.

Six weeks ago I circulated a paper discussing eight proposed radioactive waste criteria. I have since received comments from several people. While I have not yet revised the paper to incorporate the comments received, I will offer for your consideration three criteria that I do not anticipate amending.

The first and the fundamental criterion is that:

> There should be high confidence that the cumulative risk to all future generations from radioactive waste should be less than, or (considering uncertainties in the calculation) comparable to, the cumulative risk to all future generations from the original uranium resources from which the radioactive wastes were derived, assuming these uranium resources were unmined.

The attempt here is to choose a criterion based on a theory of justice. Waste criteria must be fair to future generations, independent of the benefits this generation reaps from the use of nuclear power. Arguably, the criterion could be more broadly defined. One can argue, for example, that future generations benefit from our use of nuclear energy; i.e., it saves other non-renewable resources, it represents progress, each generation benefits from the advances made by previous generations, etc. Similarly one should consider the relative benefits and risks to future generations by this generation using nuclear rather than some other alternative, such as coal where one would have to weigh the risks associated with the proliferation of nuclear weapons, CO_2 buildup, etc. But these risks and benefits are impossible to quantify. Even the sign (positive or negative) of the relative risks is unknown.

The criterion above simply ignores the net benefits of using nuclear energy. Instead, it considers only selected risks to future generations. In other words, it limits the comparison to something that is calculable. It is nevertheless an attempt to fulfill the justice requirement. Although it has this deficiency, it is, I believe, superior to other alternative criteria which have been proposed. For example, it has been suggested that:

(a) The risks from radioactive waste disposal should be small compared to natural background radiation.

(b) The risk of radioactive waste disposal should be small compared to other risks in the nuclear fuel cycle.

(c) Radiation exposure standards for waste repositories be related to existing radiation exposure standards.

Criterion (a) is rejected because it compares one risk/cost with unrelated risk/cost. This comparison fails even the logic of benefit-risk analysis.

It can be argued that there is a benefit in having a criterion that states that the radiation risk from radioactive waste disposal should be small compared to natural background, provided that (a) it is clearly understood that this is a necessary but not sufficient condition, and (b) realizing that radiation exposure comparable to background is unacceptably high. Such a criterion, however, would be unnecessary if a more strict criterion is limiting, and is the approach proposed by criterion 1 above.

Criterion (b) is rejected because it lacks equity. It is a benefit-cost comparison where the benefits remain the same but it favors those that benefit from the use of nuclear power at the expense of future generations who do not share in these benefits.

Criteria along the lines of (c) are rejected because it is foolish to think that what constitutes an acceptable environmental release standard today will be acceptable to future generations. The tightening of most environmental regulations during the past five years validates this rejection. One can postulate, and it is conceivable, for example, that in a few hundred to a few thousand years, virtually all diseases with the exception of those caused by induced changes in the DNA structure will be curable. It is conceivable that radiation will be the principal cause of genetic disease and death from cancer. In such a society radiation exposure would be viewed entirely differently

than it is today. Today's permissible release levels would be irrelevent or considered archaic. The point is, we simply do not know how future societies will perceive these risks and thus fundamental criteria should not be based solely on our current perception of these risks. The approach presently being taken by NRC and EPA of relating the criteria to "acceptable" releases today is simply short-sighted.

My criterion above is based on the premise that radiation exposure to future generations should not and need not be increased by our generation's use of uranium resources. This criterion raises some difficulties in estimating the risk that is associated with original uranium resources, but this is not perceived to be any more difficult than estimating the risks to future generations from radioactive releases from the nuclear fuel cycle -- calculations that are required and are being done today, albeit with sizable uncertainties.

Once again I want to emphasize that the waste management or disposal scheme of choice must be just to future generations. Where there is an inequitable distribution of benefits and risks, justice should take precedence over benefits in evaluating waste management decisions. In assessing the adequacy of radioactive waste management or disposal schemes, or in comparing waste management or disposal alternatives, risk-benefit analysis is an inappropriate tool and should not be the principal basis for evaluating decisions (e.g., where the benefit-to-risk cost ratio comes out greater than one). The risk-benefit tool should be limited to risk comparisons of alternative disposal schemes.

It is well known that benefit-cost analysis was not designed to make judgments about the fair distribution of economic well-being (either between people living in the present or between people living in different generations of time). Benefit-cost analysis alone cannot decide whether it is just or fair for the present to impose upon the future the burden of perpetual care for highly poisonous materials. Even if the benefit-to-cost ratio comes out greater than one, a waste disposal alternative may be unacceptable because the distribution of risk may be considered unacceptable.

Benefit-cost analysis is generally based on expected outcomes. Radioactive waste management should not do so, directly, rather it should at a minimum set an "acceptable risk level" and compare alternatives which meet that.

Consequently, the foundation of any waste disposal criterion must be based on ethical rather than econimic considerations, and consequently derive from a theory of justice.

The second criterion that should be considered is:

> The geologic medium and site selected for geologic disposal should be selected to minimize the possibility of future human intrusion during periods after which the permanence of records can no longer be relied upon. Hence, the medium should not be a valuable resource, and the site should not be located in an area where other valuable resources have been, or are likely to be mined. The geologic medium of choice should be a plentiful resource such that should it become a useful resource to future generations, its widespread availability will make it unlikely to be mined at the waste disposal site.

This criterion is designed to address the risk of release by human intervention rather than by geologic events. Arguably the risk of human intervention - after records of the repository

are lost - is higher, or at least less predictable.

This criterion could be viewed as eliminating salt as a storage medium, and certainly eliminates the Carlsbad site near potash deposits. This is undoubtedly why EPA and NRC are not utilizing this criterion.

My third criterion is:

> The radioactive waste should be stored in a retrievable manner for the period during which the repository is open, or until it can be assured with high confidence that all waste disposal criteria are met, whichever is the longer period.

The waste should be stored in a retrievable mode until there is clear evidence that we know what we are doing, and have high confidence that the desired goal will be achieved. Almost anything is retrievable at some cost. Here, retrievability implies something that can be ecomonically retrieved.

Again, you don't find this in EPA and NRC draft criteria most likely because DOE has its nuclear power protective eye on salt and it is questionable whether one can guarantee retrievability in salt beyond a few years. In this regard, the USGS has noted:

> . . .If relatively small amounts of brine can cause substantial decrease of mechanical strength and possible movement of waste during a relatively short time, special efforts will surely be necessary to insure retrievability from a salt repository for periods as short as 10-25 years. The question of whether the workings of a mine in salt can be predicted to stay dry will have to be faced. */

*/ Geologic Survey Circular #779, Geologic Disposal of High-Level Radioactive Wastes -- Earth Science Perspectives, by Bredehoeft, J.D., A.W. England, D.B. Stewart, N.J. Trask, and I.J. Winograd, 1978.

In concluding my testimony, I urge you to carefully monitor the development of radioactive waste criteria, and in this regard, I hope you will give careful consideration to the three criteria I have proposed here.