UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of	)	
	)	PR-50,51
PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE	)	(44 FR 61371)
	)	September 5, 1980
(Waste Confidence Rulemaking)	)	

CROSS-STATEMENT OF POSITION OF THE AMERICAN NUCLEAR SOCIETY

RONALD A. ZUMBRUN
Pacific Legal Foundation
455 Capitol Mall, Suite 600
Sacramento, California 95814
Telephone: (916) 444-0154

RAYMOND M. MOMBOISSE
EILEEN B. WHITE
KARLISSA B. KROMBEIN
Pacific Legal Foundation
1990 M Street, N.W., Suite 550
Washington, D.C. 20036
Telephone: (202) 466-2686

TABLE OF CONTENTS

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I

INTRODUCTION

A. The Scientific and Technical Evidence in this Record Establishes that Nuclear Waste Can Be Stored and Disposed of Without Danger to Man or His Environment

The record that is now before the Nuclear Regulatory Commission (NRC) contains evidence, studies, and findings of numerous outstanding scientific groups which establish confidence that nuclear waste */ can be stored and disposed of safely. In addition, the position

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*/ The American Nuclear Society (ANS) reiterates that it does not consider spent fuel to be waste. Spent fuel represents a significant national energy asset.

For this reason, ANS, in advocating a finding that it is now technically feasible to dispose of spent fuel, does not reject the potential of reprocessing of spent fuel. In fact, ANS submits that a finding of confidence in the current proceeding is sufficient to provide the Commissioners with equal or greater confidence that processsed, separated high-level waste can be disposed of safely and permanently.

statements of the American Nuclear Society (ANS), American Institute of Chemical Engineers, the Atomic Industrial Forum, the Utility Nuclear Waste Management Group-Edison Electric Institute, and the Department of Energy (DOE) offer reasonable and conclusive proof for a finding of confidence.

In contrast, those who express a lack of confidence ignore the evidence, relying instead on speculation and fear. A review of their statements shows that no new concerns or issues have been raised. Instead, numerous fears of alleged gaps and uncertainties are expressed. 1/ These participants show great creative imagination, but no credible basis or reliable supporting evidence to justify a finding of no confidence. Rather, they use mere argument and vague speculation, magnifying slight possibilities into frightening spectors of impending doom. They fail to identify quantitatively the nature and scope of the risk; instead they speak of it as if it were a constant undiminishing hazard of indefinable dimensions, danger, and duration. They speak of their perception of the lack of data and the need for more studies. They demand absolute assurance now that the system will perform perfectly for millions of years. They refuse to accept that the disposal system proposed, deep geologic burial, is not dependent upon the absolute integrity of any one barrier to assure that nuclear wastes are disposed of safely. Rather, the system is a composite of barriers, a defense-in-depth. Even if one element of the system degrades with time, the others will still be in place to assure the safety required. They ignore the overwhelming scientific

showing that safe disposal and storage are technically feasible. There is every reason to find confidence, and no contention of any merit to prevent such a finding.

B. The Nuclear Regulatory Commission Can and Should Find that It Has Confidence that Radioactive Waste Can Be Disposed of Safely if One Method of Disposal Is Found to Be Technically Feasible

The purpose of this proceeding is not to determine which of the various methods of disposal is "best," or to find that there is a "perfect" method. Instead, it is to reaffirm NRC's confidence that disposal is technically feasible and that there are grounds for reasonable assurance that nuclear waste can be isolated adequately from the biosphere. Thus, NRC need only find that one method can be available when needed for the safe disposal of nuclear wastes to justify a finding of confidence.

With present-day understanding of the phenomena and material properties involved in designing a mined geologic repository, it is possible to develop a technically conservative system that will achieve the desired safe disposal. We cite the Swedish KBS-II conceptual design and review as a prime example of such an approach. 2/

C. The Numerous Alleged Institutional Issues Are Legislative Matters Beyond the Authority of the Nuclear Regulatory Commission, and Consideration of Them Is Not Necessary for a Finding of Confidence

This hearing must focus on the technical feasibility of waste storage and disposal. It must not get side-tracked into consideration of social, political and institutional issues which are not germane to the question of safety and which are not within the authority of NRC.

Numerous participants have raised issues characterized as social, governmental, or institutional. They express concern with governmental organization and responsibility, with states' rights, and with citizen input. The NRC's finding of confidence should not be contingent upon the resolution of these matters because, as important as they are, NRC has no jurisidiction and no authority to resolve them. These questions must be resolved by the legislative branch of government. Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, Inc., 435 U.S. 519, 558 (1978), Natural Resources Defense Council v. United States Nuclear Regulatory Commission, 582 F.2d 166, 175 (2d Cir. 1978).

The institutional issues by their very nature are political and emotional, and cannot be resolved by rational presentation or evidentiary proof. Rather, they invite the expression of personal feelings. This is neither the time nor the place for such emotional propagandizing, and to consider such issues would be a waste of time and energy.

It should be noted that these institutional problems will be resolved, for they must be resolved. We now have a significant quantity of nuclear waste. It must be stored and disposed of safely. Thus, any institutional problems which may exist will of necessity be resolved.

This hearing should be confined to dealing with the true issues, the technical feasibility of safe storage and the disposal of nuclear wastes. These issues can and must be resolved based on the abundant scientific

evidence that nuclear waste can be stored and disposed of safely.

II

THE NUCLEAR REGULATORY COMMISSION MAY FIND CONFIDENCE IF IT HAS REASONABLE ASSURANCE THAT METHODS OF SAFE PERMANENT DISPOSAL WILL BE AVAILABLE WHEN NEEDED

The notice of this rulemaking proceeding indicated that NRC will apply the "reasonable assurance" standard. The notice provided:

> "If the Commission finds reasonable assurance that safe, off-site disposal for radioactive wastes from licensed facilities will be available prior to expiration of the facilities' licenses, it will promulgate a final rule providing that the environmental and safety implications of continued on-site storage after the termination of licenses need not be considered in individual licensing proceedings." 44 Fed. Reg. 61372, 61373 (Oct. 25, 1979) (emphasis added).

The court's decision in State of Minnesota v. United States Nuclear Regulatory Commission, 602 F.2d 412 (D.C. Cir. 1979), remanding the consideration of these issues to NRC, also suggested that use of the "reasonable assurance" standard would be appropriate. Id. at 418.

The finding of "reasonable assurance" is one that calls for the exercise of discretion by NRC. Cf. Nader v. Ray, 363 F. Supp. 946, 954-55 (D.D.C. 1973). Thus, the question is what must NRC find to have "reasonable assurance."

Some participants have argued that there must be a total resolution of all safety questions before confidence can be found. Others want an ironclad guarantee of no risk, and some would even require the actual operation of a waste

repository as a condition to finding confidence. None of this is required.

As has been stated so often:

> "Absolute or perfect assurances concerning public health and safety are not required by [the Atomic Energy Act], and neither present technology nor public policy admit of such a standard. Citizens for Safe Power, Inc. v. NRC, 173 U.S. App. D.C. 317, 323, 524 F.2d 1291, 1297 (1975)." Natural Resources Defense Council v. U.S. Nuclear Regulatory Commission, 582 F.2d 166, 168 (2d Cir. 1978).

Unresolved safety questions regarding waste disposal do not prohibit a finding of confidence, if NRC has reasonable assurance that the question will be resolved prior to completion of the repository. Cf. Power Reactor Development Co. v. International Union of Electrical, Radio & Machine Workers, 367 U.S. 396, 409 (1961). Such a finding can be based on a judgment that the technical information needed will be available in time for the final safety evaluation of the disposal site. Cf. Porter County Chapter v. Nuclear Regulatory Commission, 606 F.2d 1363, 1369 (D.C. Cir. 1979). Indeed, the court in State of Minnesota v. United States Nuclear Regulatory Commission, 602 F.2d at 417, characterized the disposal of nuclear waste as an area where the "ultimate determination can never rise above a prediction."

The conclusion that a finding of confidence does not require total present knowledge is supported by an analogy between this proceeding and the issuance of a construction permit for a nuclear reactor. The NRC and the courts have recognized that a distinction exists in the

proof necessary to establish reasonable confidence between the issuance of a construction permit as contrasted with a license to operate. This difference is based on the need for more positive assurance at the time the license is issued, at which time the facility becomes operative. In contrast, the issuance of the permit does not give rise to immediate dangers that may result from operation. In the latter situation, there is adequate time to evaluate problems and find solutions.

The same principle is applicable here, particularly because this is a generic proceeding. The NRC has announced the purpose of this proceeding as follows:

> "The purpose of this proceeding is solely to assess generically the degree of assurance now available that radioactive waste can be safely disposed of, to determine when such disposal or off-site storage will be available, and to determine whether radioactive wastes can be safely stored on-site past the expiration date of existing facility licenses until off-site disposal or storage is available." 44 Fed. Reg. 61373 (Oct. 25, 1979).

Because it is generic, this proceeding is concerned with the overview of the feasibility of safe nuclear waste storage and disposal. It is not concerned with the approval of a specific method, the selection of a specific site, or the licensing of a specific repository. This is merely a first step towards the eventual establishment of a waste program and construction of actual facilities. Thus, not all questions must be completely resolved now. Indeed, they cannot be, for resolution of many issues will

be dependent upon the system chosen and the site selected. Detailed hearings and proof will be required later before NRC issues its licenses for these facilities. 42 U.S.C. § 5842(3) and (4).

Since there is ample time to resolve any unanswered questions, NRC is more than justified in finding confidence if it has reasonable assurance that a disposal system will be available at the time when it is needed. Such confidence is more than justified by the evidence before NRC at this time.

III

THE SHORT-TERM HAZARDS FROM NUCLEAR WASTES MUST BE CONTRASTED WITH THE LONG-TERM HAZARDS IN EVALUATING THE EFFECTIVENESS OF DISPOSAL METHODS

The first step towards resolving the question of confidence is to determine what hazards exist and for how long. It is apparent from the statements that many participants have no concept of what the risks are or their duration. Because of this, they argue that any disposal system must remain intact for millions of years, if not for infinity. The obvious human inability to guarantee such a system is then used as an argument for finding no confidence. It is an argument whose fallaciousness is exposed when the true risk/duration problem is recognized.

The scientific evidence establishes that the requirements for the waste disposal system are quite different in the short term (less than 1,000 years) than in the long term, due to the phenomenon of radioactive decay. 3/

The afore-mentioned analyses establish that the period of major concern is not one million years, as alleged by numerous participants 4/, but is nominally 500 to at most 1,000 years, the value tentatively identified by the Environmental Protection Agency in its proposed criteria. 43 Fed. Reg. 53262 (1978).

Obviously, the ability to develop a system that will remain intact for this shorter period of time and to predict its performance is much greater than the ability necessary to design a system which will last for eternity. This is why it is so important to evaluate the actual risks, their magnitude and their duration.

IV

RADIOACTIVE WASTES AND SPENT FUEL CAN BE, AND IN FACT HAVE BEEN, STORED SAFELY FOR DECADES

A. Scientific and Technical Evidence in the Hearing Record Establishes a High Degree of Confidence that the Extended Storage of Spent Fuel is Technically Feasible and Safe

An issue in this rulemaking proceeding is the technical basis for confidence in the extended (up to 100 years) storage of expended nuclear fuel. To the degree that extended storage of light water reactor (LWR) spent fuel is feasible, the issue of the precise timing and availability of specific facilities becomes of less importance in this proceeding.

Participants opposing extended storage of nuclear waste allege that it is not safe. However, the record and experience demonstrate the contrary. Studies establish that the integrity of stainless steel and Zircaloy-clad

commercial LWR spent fuel, including fuel with cladding defects, has been satisfactory in water pool storage. 5/ Zircaloy-clad LWR spent fuel has now been in storage for over 20 years, with no adverse effects on the public. Furthermore, LWR spent fuel has been handled at nuclear power plants with exposures to operating personnel being well within the NRC safety limits. 6/ (The NRC limit is 5 man-rem per year.)

The NRC has already stated that "the storage of LWR spent fuel in water pools has an insignificant impact on the environment, whether at AR [at reactor] or at AFR [away from reactor] sites." 7/ The temperatures and pressure associated with extended LWR spent fuel storage are negligible when compared with fuel conditions in an operating reactor. The peak centerline temperatures for fuel are substantially higher in the reactor (1200-1350°C) than in fuel pools (100°C). Cladding temperatures are substantially less than the peak centerline temperatures. Fuel pools are normally at less than 50°C. 8/ With time, the heat generation rate diminishes. The heat generation rate for LWR spent fuel decreases from approximately 10,200 watts per metric ton of uranium (MTU) at one year after discharge, to approximately 1,200 watts per MTU at ten years after discharge, to approximately 720 watts at 30 years after discharge. As the heat generation rate decreases, the temperature also decreases. At the lower temperatures, degradation mechanisms such as hydriding, fission product attack, helium embrittlement,

oxidation, stress corrosion, cracking, galvanic effects, and pitting corrosion are less likely and are routinely accommodated by licensed installed systems and operating procedures.

Spent fuel with cladding defects has been stored, handled and reprocessed without substantial problems. Methods have been developed to deal with defective fuel, including closed canisters for isolating the fuel. In the United States, the large majority of defective LWR fuel bundles is stored on the same basis as intact cladding. 9/

B. Other Studies Have Shown Long-Term Storage of Spent Fuel to be Safe and Feasible

The Swedish KBS-II Plan includes 40-year storage in a water basin after leaving temporary storage at the reactor. This longer term storage is intended to permit sufficient radioactive decay so that the temperatures in the ultimate repository can be kept below 80°C. 10/ The reduced performance requirements for fuel in storage allow fuel to be stored for extended periods of time greater than the 40 years now permitted under licenses for components that operate at reactor temperatures and pressures.

Water basins designed for the storage of LWR spent fuel are designed to meet stringent seismic requirements, thus minimizing the likelihood of a loss of coolant accident. However, in the unlikely event that an occurrence takes place which results in structural damage to water basin liners or components, such damage could be repaired using routine construction practice. The probability of such an event

occurring is considered to be extremely low (10^{-7} per year). 11/ Such a remote possibility of damage and the ability to repair it should remove this concern from the proceeding.

C. The Capability to Store Spent Fuel Safely for Long Periods of Time Means that the Precise Dates of the Availability of Off-Site Storage or Disposal Facilities Are Not Matters of Public Health and Safety or Environmental Protection

The question of the precise dates of availability of off-site storage or disposal facilities has been discussed at length in this proceeding. 12,13,14/ The dates submitted by DOE for operation of disposal facilities are between 1997 and 2006. ANS indicated in its position statement that these dates are very conservative for the program, and could be implemented much sooner because the schedule is controlled by administrative rather than technical considerations. 15/

The NRC should recognize that the schedule and milestones to meet these dates are controlled by policy decisions as well as legislative and administrative requirements for hearings, reviews, data collection procedures, and evaluations. A series of events including adoption of very conservative repository design approaches, and accelerated regulatory processes which would permit earlier dates for operation of geologic disposal facilities can and should be envisioned.

Similarly, a series of political decisions, reductions in funding, and policy changes can be postulated that would result in even later operation of ultimate

disposal facilities. The most important factor in public acceptance is the finding of confidence coupled with evidence that a positive program is in place to construct the first repository. Nevertheless, the longer the time schedule, the greater the likelihood of increased public skepticism and deterioration of public confidence.

The scientific evidence in this proceeding regarding the feasibility of spent fuel storage provides more than reasonable assurance that spent fuel can be stored for long periods of time. Thus, the capability of DOE to build and put into operation particular facilities between 1997 or 2006, a period 17 to 26 years in the future, is not a compelling reason to justify either a present nuclear plant moratorium, 16/ or an extensive review of the proposed schedule. A finding of confidence can therefore be based on the present technical capability for safe waste storage and safe waste disposal.

V

THE RECORD ESTABLISHES THAT NUCLEAR WASTES CAN BE DISPOSED OF SAFELY, AND NOTHING OF MERIT HAS BEEN INTRODUCED TO THE CONTRARY

A. No Credible Arguments or Proof Have Been Introduced to Discredit the Past Conclusions of the Nuclear Regulatory Commission and of Every Major Scientific Study that Nuclear Wastes Can Be Disposed of Safely

The record in this proceeding establishes that nuclear waste can be disposed of safely. Indeed, one of the major critics of the waste disposal program concedes this point. The Natural Resources Defense Council (NRDC) in its submittal states:

> "The simple question of whether wastes 'can' be disposed of safely is not at issue. No informed commentator has claimed that it is now and will continue to be impossible to isolate or contain high-level radioactive wastes. No laws of physics must be violated to produce a waste disposal program. Theoretically therefore, waste containment and isolation are feasible."
> NRDC position statement, p. 9.

Numerous independent technical assessments of nuclear waste disposal safety have been summarized and introduced into the hearing record. 17,18,19/ The ANS position statement cited numerous prior studies by prestigious scientific groups and government agencies that have concluded that radioactive wastes can be disposed of safely. The Swedish KBS-II project is decisive evidence that radioactive wastes can be disposed of safely. 20/ We also note that the Committee on Nuclear and Alternative Energy Systems of the National Research Council, the Study Group on Nuclear Fuel Cycles and Waste Management of the American Physical Society, and Working Group 7 of the International Fuel Cycle Evaluation all concluded that the management and disposal of radioactive wastes can be carried out with a high degree of safety and without risk to man or the environment. In light of this overwhelming evidence, those opposed to a finding of confidence have totally failed to show any valid reason why nuclear wastes cannot be disposed of safely.

B. The Position Statements of Participants Who Oppose a Finding of Confidence Fail to Comprehend the Significance of the Defense-in-Depth System for the Safe Disposal of Radioactive Waste

Many of the position statements demonstrate a singular lack of comprehension not only of the problems actually presented by nuclear waste, but also of the system that is proposed to handle waste disposal. They fail to recognize that it is a multi-barrier or defense-in-depth system. 21,22/ The protections provided by the site selection process and by engineered emplacement of the waste provide as many as three more barriers between subterranean radioactivity and man than are found in naturally occurring deposits of radioactive materials such as ore. 23/

The impression that many of the position statements try to create is that the failure of one element of the waste disposal system will inexorably lead to the release of radioactivity into the environment. However, because of the differences in failure mechanisms, the failure of one barrier in the system does not necessarily lead to the degradation failure of any of the others. Stressing "inadequacies" of one component, or even several components, in that system ignores the fact that the protection afforded by a defense-in-depth system is specifically designed to be greater than the sum total of its parts.

The migrating radionuclide faces a formidable task if it is to make its way into the biosphere: the multi-barrier system must be penetrated, the canister must be broken or corroded, and the waste form must be susceptible to leaching. Beyond this, the route to the environment

must be fairly swift and direct, if the radionuclide is to avoid becoming absorbed into the surrounding medium or decay to a non-hazardous state before it reaches the biosphere. Because of the multiple barriers, it is highly unlikely that such a scenario would occur, particularly during the first 500 to 1,000 years when the danger posed by the release of radioactivity is of greatest concern. Beyond this time, even total failure of the system could lead only to a nominal increase in the release of radioactivity.

The skeptical participants also attempt to create doubt by fragmenting the deep burial defense-in-depth system. They separate out each component and treat it as if it alone acted as a barrier. This is not true. The system is designed so that each component supplements the other components. The record fully demonstrates that the system, as a whole, will provide a safe method of nuclear waste disposal.

CONCLUSION

ANS, based on its independent review of the statements and references filed in this proceeding, respectfully submits that overwhelming evidence has been placed before the NRC that nuclear waste can be stored and disposed of safely. No credible arguments or proof have been introduced to discredit the past conclusions of the NRC and of every major scientific study that nuclear wastes can be stored and disposed of safely. The statements of participants who oppose a finding of confidence fail to comprehend the

significance of the defense-in-depth system for the safe disposal of radioactive waste.

Based on this scientific and technical evidence, NRC must find that:

1. Spent nuclear fuel from licensed facilities can be disposed of in a safe and environmentally acceptable manner;

2. The Federal government's plan for establishing geologic repositories is an effective and reasonable means for developing a safe and environmentally acceptable disposal system;

3. Spent nuclear fuel from licensed facilities can be stored in a safe and environmentally acceptable manner on-site or off-site until disposal facilities are available; and

4. Sufficient additional storage capacity for spent nuclear fuel from licensed facilities can be provided as needed.

Having made these findings, NRC should promulgate a rule providing that the safety and environmental implications of spent nuclear fuel remaining on-site after the anticipated expiration of the facility licenses involved

need not be considered in individual facility licensing proceedings.

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Respectfully submitted,

RONALD A. ZUMBRUN
RAYMOND M. MOMBOISSE
EILEEN B. WHITE
KARLISSA B. KROMBEIN

By: Raymond M. Momboisse
RAYMOND M. MOMBOISSE

Attorneys for The American Nuclear Society

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1/ See, e.g., Position Statements of California Energy Commission, Natural Resources Defense Council, and the state of New York.

2/ National Academy of Sciences, "A Review of the Swedish KBS-II Plan for Disposal of Spent Nuclear Fuel" (Jan. 1980).

3/ See, e.g., Position Statements of American Nuclear Society (ANS), pp. 10-15, Utility Nuclear Waste Management Group-Edison Electric Institute (UNWMG-EEI), Doc. 2, pp. 1-14 to 1-29, and Doc. 3, pp. 2-5.

4/ See, e.g., Position Statement of the state of New York, p. 43.

5/ Johnson, Jr., A. B., "Spent Fuel Storage Experiences," Nuclear Technology, Vol. 43, p. 167 (April 1979).

6/ Position Statement of Tennessee Valley Authority, p. 5.

7/ United States Nuclear Regulatory Commission, "Final Generic Environmental Impact Statement-Handling and Storage of Spent LWR Fuel," NUREG-0575, pp. 5-12, (Aug. 1979).

8/ Op. cit., Johnson (Ref. 5), p. 167.

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10/ Committee of Radioactive Waste Management, National Academy of Sciences, A Review of the Swedish KBS-II Plan for Disposal of Spent Nuclear Fuel, p. 22 (1980).

11/ Darr, D.G., "Studies and Research Concerning BNFP, Safety and Environmental Impact of Interim AFR Storage in the FRSS," AGNS-1040-1.5-6.3, p. A-6, March 1979.

12/ Position Statement of Department of Energy (DOE), Section III

13/ Op. cit., UNWMG-EEI (Ref. 3), Doc. 2, Section IV-1.

14/ Position Statement of Atomic Industrial Forum, pp. 4-5.

15/ Op. cit., ANS (Ref. 3), p. 3.

16/ Op. cit., state of New York (Ref. 4), p. 111.

17/ Op. cit., DOE (Ref 3) Section II-E, pp. II-129-368 .

18/ Op. cit., UNWMG-EEI (Ref. 3), Doc. 3, pp. 1-46.

19/ Koplik, C.M., et al., Electric Power Research Institute, NP-1197.

20/ Op. cit., ANS (Ref. 3), pp. 24-28.

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23/ Ibid., Doc. 2, p. 1-26-27.