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NUCLEAR WASTE—THE CASE FOR CONFIDENCE IN DISPOSAL

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and

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I. INTRODUCTION

As reflected in this Symposium, the public debate about the acceptability of nuclear power has concentrated in the last few years largely on radioactive waste management. In 1979, the United States Nuclear Regulatory Commission (the Commission or NRC) commenced a rulemaking proceeding to review: (1) its degree of confidence in what will be the disposition of spent nuclear fuel¹ stored at the sites of operating commercial power reactors, and, (2) how questions about such disposition should be addressed in individual NRC licensing proceedings.² The proceeding has come to be known as the "Waste Confidence

EDITOR'S NOTE: The views expressed in this Article are not necessarily those of the U.S. Department of Energy, but are the views of the authors. Portions of the Article are drawn substantially, however, from position statements prepared for the Department of Energy. In the interest of clarity, citations to the statements have been omitted where they would serve no beneficial purpose.

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1. "Spent nuclear fuel" is fuel that has been irradiated in a nuclear reactor to the point that it no longer contributes to the nuclear chain reaction and must be replaced. The basic component of the fuel for a nuclear power plant is a pellet of uranium oxide about the size of a pencil eraser. Pellets are loaded into 12 to 13-foot-long zircalloy tubes, which are sealed and bundled together into fuel assemblies each containing between 50 and 270 tubes. Spent nuclear fuel typically is removed from a power reactor at approximately annual intervals (depending upon a number of variables including the plant's capacity factor) and replaced by fresh fuel. About one-fourth to one-third of the fuel assemblies in the core are removed and replaced. For a typical 1000-megawatt reactor, this amounts to about 27 to 31 tonnes (metric tons) of fuel, or 65 to 180 fuel assemblies per year. When spent nuclear fuel leaves the reactor and is transferred to on-site storage pools, it is thermally hot and highly radioactive. Much of the heat and radiation decay away after about 5 years. The spent fuel, however, remains potentially dangerous over much longer periods of time.

2. See *Storage and Disposal of Nuclear Waste*, 44 Fed. Reg. 61372 (1979).

Rulemaking.” The rulemaking, which still is underway, has provided a major public forum on waste management. It has given both proponents and opponents of the nuclear option an opportunity to present their views on the adequacy of our country’s high-level nuclear waste³ policy. An enormous record already has been amassed.⁴ The outcome of this proceeding could have an important impact on the contribution nuclear power will make to our future energy needs and on the public’s perception of its relative costs and benefits to society.

This Article presents the case for “confidence” in the ability to dispose of high-level nuclear waste in a safe and environmentally acceptable manner, as presented in the Waste Confidence Rulemaking by the United States Department of Energy (the Department or DOE). First, it would be helpful to review the background and scope of the proceeding itself.

A. Background and Scope of the Rulemaking

The Commission has defined the scope of the Waste Confidence Rulemaking 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 of existing facility licenses until off-site disposal or storage is available.⁵

The rulemaking was initiated by the Commission in response to the decision of the United States Court of Appeals for the District of Columbia Circuit in *Minnesota v. Nuclear Regulatory Commission*.⁶ It also is a continuation of previous proceedings conducted by the Commission to evaluate its confi-

3. “High-level nuclear waste” is spent nuclear fuel, if disposed of, or the aqueous solution from the first-cycle solvent extraction, in which spent nuclear fuel is reprocessed for recycling of uranium and plutonium. Spent nuclear fuel is the representative waste form being considered in the Waste Confidence Rulemaking. See text accompanying notes 17-19 *infra*.

4. The record now consists of statements of position, cross-statements, suggestions as to further proceedings, the NRC staff working group report and comments thereon, and hundreds of supporting references. See note 20 and accompanying text, *infra*.

5. 44 Fed. Reg. 61372, 61373 (1979).

6. 602 F.2d 412 (D.C. Cir. 1979).

dence concerning the availability when needed of safe methods for disposal of high-level nuclear wastes.⁷

On May 23, 1979, the Court of Appeals in *Minnesota* remanded two commercial licensing actions⁸ to the Commission to consider whether an off-site storage solution for commercial high-level nuclear wastes will be available by the expiration dates of the operating licenses of the Vermont Yankee and Prairie Island nuclear power plants. The Commission had granted permits to increase on-site spent fuel storage facilities at these plants. The court directed the Commission to consider in the alternative whether spent fuel can be stored at the plant sites past those dates and until an off-site solution is available. The court did not set aside or stay the challenged license amendments, an action which would have effectively shut down the plants.⁹ The court agreed with the NRC that it could properly consider the complex issue of nuclear waste disposal in a "generic" proceeding, such as a rulemaking, and then apply its determination in subsequent adjudicatory proceedings.¹⁰ The court had no problem rejecting a hypothesized need for individualized determinations since the central issue posed by those challenging the license amendments—the feasibility of interim or ultimate nuclear waste disposal solutions—is essentially common to all nuclear facilities.¹¹ The court specifically declined to dictate the procedures for the NRC's "generic" proceeding.

On October 25, 1979, the Commission commenced the proceeding by issuing a Notice of Proposed Rulemaking, which provided for a hybrid, legislative-type rulemaking.¹² More than

7. See 44 Fed. Reg. 61372, 61373 (1979). In 1977, the Natural Resources Defense Council requested that the NRC conduct a rulemaking to determine whether high-level radioactive waste produced by nuclear power plants can be disposed of safely. 42 Fed. Reg. 34391 (1977), *petition for review dismissed sub nom.*, Natural Resources Defense Council v. Nuclear Regulatory Comm'n, 582 F.2d 166 (2d Cir. 1978). As a participant in the Waste Confidence Rulemaking, the NRDC has been given the opportunity to present its views on waste disposal that it sought in its 1977 petition.

8. 602 F.2d at 420.

9. *Id.* at 418.

10. *Id.* at 417.

11. *Id.*

12. 44 Fed. Reg. 61372 (1979). The notice provided that the Commission would compile a full bibliography on relevant subjects and make it available to the public at an early stage of the proceeding. The notice also indicated that written statements of position would be the participants' principal contribution to the rulemaking and that participants should focus their preparation on them. The Commission said the initial state-

fifty-five entities filed notices of intent to be full participants in the rulemaking. These included the Department of Energy as well as agencies of twenty states, electric utilities, environmental groups, professional societies, and a few individuals.

On January 29, 1980, a prehearing conference was held by the presiding officer appointed by the Commission to monitor the early stages of the proceeding and to assist the Commission in conducting the later portions.¹³ It was attended by most participants and NRC staff representatives.¹⁴ Following the conference, the presiding officer issued an order providing that DOE would file its statement of position first, that the other participants would file theirs next, and that all participants then would file cross-statements.¹⁵ Subsequently, all participants would submit their written suggestions about further proceedings, additional areas of inquiry, or further data or studies. A second prehearing order setting out the procedures for the remainder of the proceeding would follow.¹⁶

ments should set forth the participants' views and the underlying assumptions, both technical and institutional, for those views. The notice provided that written cross-statements limited to material discussed in the initial statements would be submitted next. The possibility of oral presentations later was left open, and the Commission reserved the option of providing a final stage at which representatives of the participants might be cross-examined by other participants upon a demonstration that cross-examination is necessary to prepare a record adequate for a sound decision. *See id.*

13. Waste Confidence Rulemaking, Prehearing Conference Transcript at 1-162 (January 29, 1980).

14. The NRC commissioners later issued a memorandum and order defining the role of the NRC staff in the Waste Confidence Rulemaking following their receipt of two motions from participants requesting that the NRC staff be assigned an explicit role to assure the development of an adequate record in the proceeding. Waste Confidence Rulemaking, Memorandum and Order (May 23, 1980). The commissioners' order directed the NRC's Office of Policy Evaluation to form a "working group" to advise the Commission regarding the adequacy of the record to be compiled. The working group is composed of personnel from the NRC Offices of Policy Evaluation, the General Counsel, and the executive legal director and is provided with technical support by the NRC program offices of Nuclear Materials Safety and Safeguards, Research, and Standards Development. *Id.*

15. Waste Confidence Rulemaking, First Prehearing Conference Order (February 1, 1980). Because it was filed first, the DOE statement served as a focus—some would say "target"—for the other participants' statements. The other participants had more than two and one-half months to analyze and comment upon DOE's statement before theirs were due on July 7, 1980.

16. Before a second prehearing order could be issued, the Commission directed the working group to prepare "a report which summarizes the record, identifies key issues and controversies, and indicates insofar as possible at this stage of the proceeding how their resolution could affect the Commission's decision." Waste Confidence Rulemaking,

The presiding officer's first prehearing order contained an important definition of the scope of the rulemaking. He ruled that the proceeding would consider, as the representative case for handling high-level nuclear wastes, disposal and storage of spent nuclear fuel taken directly from commercial power reactors.¹⁷ This was appropriate in view of the fact that the Commission in the Waste Confidence Rulemaking needs to determine whether there is reasonable assurance only that spent fuel in some form can be safely stored and disposed of by any single method. This approach also was consistent with the previous suspension by the Commission of further consideration of reprocessing of spent fuel from commercial reactors¹⁸ following the decision of President Carter on April 7, 1977, to defer indefinitely all civilian reprocessing of spent fuel. At the same time, in presenting its assessment of confidence in the ability to store and dispose of spent fuel, the Department noted that it was *not* suggesting a judgment of the potential suitability or non-suitability of other techniques such as reprocessing and solidification of resultant nuclear wastes.¹⁹

The Department's statement of position of about 700 pages was filed and served on each participant on April 15, 1980.²⁰ Thirty-one statements of position, which ranged in length from one to more than 450 pages, were submitted by the other participants. Cross-statements of all participants (including DOE) were due by September 5, 1980; twenty-one were filed. Sixteen suggestions concerning further proceedings subsequently were filed in October 1980. The NRC Staff Working Group submitted its report on January 29, 1981. Comments on this report were

Memorandum and Order (January 16, 1981). The working group was instructed not to make recommendations or express views regarding the conclusions that the Commission should reach on these issues. *Id.*

17. The presiding officer also ordered that issues of low-level radioactive waste, uranium mill tailings, and the safety of transportation of waste materials were not within the proceeding's scope. *See* Order, *supra* note 15, at 11.

18. *See* 42 Fed. Reg. 65334 (1977).

19. *See* U.S. DEP'T OF ENERGY, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE at I-2 (April 15, 1980)(hereinafter cited as DOE STATEMENT OF POSITION).

20. Additionally, the Department, by letter dated January 18, 1980, had submitted to the Commission a computer list of approximately 11,922 references and abstracts on waste storage and disposal. The Department also forwarded to the Commission copies of hundreds of the references cited by the Department for the use of the Commission and for placement in the Commission's Public Document Room in Washington, D.C.

due by March 5, 1981; nineteen sets were filed.²¹

B. Department of Energy Authority and Experience²²

It was appropriate for the Department of Energy to agree to submit its initial statement in advance of the other participants in the rulemaking because the Department has the statutory mandate and lead responsibility to conduct research for the federal government concerning nuclear waste management and the ultimate disposal of certain nuclear materials.²³ The role of the Department as the lead agency for the management and disposal of radioactive wastes was reiterated by the President in a message to Congress on February 12, 1980.²⁴ Pursuant to this responsibility, the Department is conducting the National Waste Terminal Storage (NWTS) Program for the disposal of radioactive waste, including methods to isolate such waste and to identify appropriate sites for disposal facilities.²⁵

The Department and its predecessor agencies have been involved in the management of radioactive waste since 1944 when radioactive waste was first generated as a byproduct of national defense programs.²⁶ The principal source of this waste has been the reprocessing of reactor fuel to recover fissionable materials for use in the nation's defense program. Radioactive waste also has resulted from the production of components for weapons, laboratory experiments, and reactor operations.²⁷

21. The NRC Commissioners directed that, following submission of these comments, the presiding officer should forward them to the Commissioners along with his recommendations concerning further proceedings. Waste Confidence Rulemaking, Memorandum and Order (January 16, 1981). In light of this directive, DOE renewed its request of October 6, 1980, that the participants be given an opportunity to submit written comments on any proposed procedures for further submissions or oral presentations before the Commission closes the record in the rulemaking. U.S. DEP'T OF ENERGY, COMMENTS ON REPORT OF NUCLEAR REGULATORY COMMISSION STAFF WORKING GROUP (1981).

22. For a discussion of the statutory basis for federal regulation of nuclear waste, see Jaksetic, *Constitutional Dimensions of State Efforts to Regulate Nuclear Waste*, 32 S.C.L. REV. 789, 791-801 (1981).

23. See 42 U.S.C. § 2052 (1976); 42 U.S.C. § 7133 (Supp. II 1978).

24. President's Message to Congress on a Radioactive Waste Management Program, 16 WEEKLY COMP. OF PRES. DOC. 296 (Feb. 12, 1980).

25. See note 62 *infra*.

26. For a historical overview of federal regulations of nuclear waste, see Hart, *A Failure to Enact: A Review of Radioactive Waste Issues and Legislation Considered by the Ninety-Sixth Congress*, 32 S.C.L. REV. 639, 658-77 (1981).

27. See U.S. DEP'T OF ENERGY, NUCLEAR WASTE MANAGEMENT PROGRAM SUMMARY

In the years since 1944, the Department and its predecessor agencies have accumulated thousands of man-years of experience in managing radioactive waste at various sites around the country. During this time, active health and safety programs have been maintained to reduce industrial and radiological accidents to remarkably low levels. Accidents and releases of radioactive materials have occurred, but there have been no injuries to members of the public or serious environmental damage as a result of these operations.

C. *The Standard for Determining "Confidence"*

Throughout its statement of position and cross-statement, the Department argued that it has a nuclear waste management program capable of handling, storing, and disposing of spent nuclear fuel from commercial power reactors. The initial statements of some participants discussed the degree of proof the Commission should apply in making this generic assessment. The Department noted in its cross-statement that the Commission previously indicated that any final rule resulting from the proceeding will have to be based upon a finding of "reasonable assurance" that the facts underlying that rule are true. In the Notice of Proposed Rulemaking announcing the proceeding, the Commission said:

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.²⁸

The Department took the position that it is appropriate that the Commission apply the "reasonable assurance" standard in the proceeding and that suggestions by a few participants that the Commission should apply a different standard should be rejected.²⁹ The rulemaking, it was recalled, was initiated by

DOCUMENT FY 1981 at III-3 (1980).

28. 44 Fed. Reg. 61372, 61373 (1979) (emphasis added).

29. The NRC staff working group listed the standard for finding confidence as one of the major issues in the proceeding. DOE has taken the position that this matter

the Commission in response to the decision of the District of Columbia Circuit in *Minnesota*.³⁰ Although the court specifically declined to dictate the procedures to be followed in this proceeding,³¹ it did say that “[t]he breadth of the question involved and the fact that the ultimate determination can never rise above a prediction suggest that the determination may be a kind of legislative judgment for which rulemaking would suffice.”³²

Additional guidance on the standard to be applied by the Commission was provided by Judge Tamm’s concurring opinion in the same case. “Specifically, there must be a determination whether it is *reasonably probable* that an off-site fuel repository will be available when the operating license of the nuclear plant in question expires.”³³ Judge Tamm added:

Our opinion merely remands this case to the Commission for such proceedings as it deems appropriate to determine whether there is reasonable assurance that an offsite storage solution will be available when needed—in this case, by the years 2007-2009.³⁴

Some other participants apparently agree that the Commission should use the standard of “reasonable assurance” as the basis for a finding of “confidence” in the safe and timely implementation of proposed disposal and storage programs.³⁵ However, full agreement among the participants as to what constitutes “reasonable assurance” in the context of the rulemaking does not exist. For example, one participant suggested the need for an “extraordinarily high degree of assurance,”³⁶ while an-

should not be treated as an open issue in the Waste Confidence Rulemaking.

30. 602 F.2d 412 (D.C. Cir. 1979).

31. *Id.* at 417.

32. *Id.* (emphasis added).

33. *Id.* at 419 (emphasis added) (Tamm, J., concurring).

34. *Id.* at 420.

35. *See, e.g.*, NEW ENGLAND COALITION ON NUCLEAR POLLUTION, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE at 9-13 (July 7, 1980); UTILITY NUCLEAR WASTE MANAGEMENT GROUP-EDISON ELECTRIC INSTITUTE, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE, Document 2 at I-2 (July 7, 1980); OCEAN COUNTY AND TOWNSHIP OF LOWER ALLOWAYS CREEK, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE at 5 (July 10, 1980).

36. ENVIRONMENTAL COALITION ON NUCLEAR POWER, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE at 3 (July 1980).

other suggested that the Commission must have “the highest degree of confidence.”³⁷ The Department has argued that the latter suggestions go beyond the “*reasonable assurance*” standard and that findings should be based upon sound judgment, but not extraordinary or absolute certainty.

Use of the “reasonable assurance” standard proposed by the Commission will ensure compliance with the “substantial evidence” standard, the standard established by the Administrative Procedure Act (APA) for rulemaking proceedings.³⁸ Thus, it is a proper exercise of the Commission’s discretion to formulate procedures for making substantive judgments in rulemaking proceedings both because it is in compliance with the APA and because the courts previously have upheld Commission decisions based upon it.³⁹

One participant argued that the Commission should vote for no confidence if the weight of evidence tips only slightly toward confidence.⁴⁰ Adopting this suggestion effectively would require the standard of “beyond a reasonable doubt” used in criminal prosecutions. The requirement, the Department said, would be inappropriate in an NRC rulemaking. Neither the Atomic Energy Act of 1954⁴¹ nor the Commission regulations⁴² require totally risk-free actions.⁴³ Requirement of absolutely risk-free actions would be similar to other absolute positions and arguments that have been rejected by the courts.⁴⁴

The Department has said the Commission also should reject suggestions that a finding of “confidence” requires extrasensory perception, as the Natural Resources Defense Council (NRDC) and another participant intimated. NRDC argued that to say

37. STATE OF NEW YORK, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE at 26-27 (July 7, 1980) (hereinafter cited as STATE OF NEW YORK, STATEMENT OF POSITION).

38. See 5 U.S.C. § 556(d) (1976).

39. See, e.g., *New England Coalition on Nuclear Pollution v. Nuclear Regulatory Comm’n*, 582 F.2d 87, 93 (1st Cir. 1978); *North Anna Env’tl Coalition v. Nuclear Regulatory Comm’n*, 533 F.2d 655, 665 (D.C. Cir. 1976).

40. STATE OF NEW YORK, STATEMENT OF POSITION, *supra* note 37, at 40-41.

41. 42 U.S.C. §§ 2011-2296 (1976).

42. 10 C.F.R. §§ 0.735-1 to 170.41 (1980).

43. See *Nader v. Nuclear Regulatory Comm’n*, 513 F.2d 1045, 1050 (D.C. Cir. 1975); *Nader v. Ray*, 363 F. Supp. 946, 954-55 (D.D.C. 1973).

44. See *North Anna Env’tl Coalition v. Nuclear Regulatory Comm’n*, 533 F.2d 655 (D.C. Cir. 1976).

that safe storage *will* occur “requires clairvoyance, with which neither the DOE nor the NRC is equipped.”⁴⁵ The other participant expressed a concern that various institutional problems render any attempt to forecast the date for the operation of the system, which it admits is technically feasible, “to be little more than an attempt at clairvoyance without the benefit of a crystal ball.”⁴⁶ The Department countered that it is absurd to suggest that the Commission cannot find confidence in the safe and timely implementation of proposed disposal and storage programs unless it is endowed with superhuman powers. If such a standard were required to be the basis for administrative actions, no decisions could be reached or actions taken.

The Department’s position has been that the Commission must base a finding of confidence on an informed, but mortal prediction of germane technical and program matters. The effectiveness of long-term disposal, unlike the effectiveness of other industrial activities, such as novel power generation techniques, cannot be demonstrated to the degree some have suggested. As another participant pointed out, such demonstration would require observation of the repository over the time period during which wastes remain hazardous.⁴⁷ Obviously, means other than observations over hundreds or thousands of years must be used to evaluate the safety of proposed disposal systems.

Another participant argued that the Commission must establish criteria to govern the degree of assurance required for a finding of “reasonable assurance.”⁴⁸ The Department reiterated its position that the high-level waste disposal system objectives proposed in its initial statement⁴⁹ provide an appropriate basis for assessing in the proceeding the technical adequacy of the De-

45. NATURAL RESOURCES DEFENSE COUNCIL, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE at 93 (July 7, 1980) (hereinafter cited as NRDC STATEMENT OF POSITION).

46. STATE OF OHIO, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE at 3 (July 7, 1980).

47. See UTILITY NUCLEAR WASTE MANAGEMENT GROUP-EDISON ELECTRIC INSTITUTE, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE, Document 3 at I-3 (July 7, 1980).

48. NEW ENGLAND COALITION ON NUCLEAR POLLUTION, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE at 9-13 (July 7, 1980).

49. DOE STATEMENT OF POSITION, *supra* note 19, at II-3 to -21. See text accompanying notes 64-66, *infra*.

partment's disposal program and of the systems that will result from its implementation. By contrast, the Commission can measure its confidence in the safety of interim storage on the basis of existing NRC regulations.⁵⁰ With respect to assessing DOE program plans, which requires predicting the future course of human activities, the Department indicated the Commission should determine whether acceptable measures will be taken on a timely basis. Findings of confidence in each of these matters should be made by the Commission when there is "reasonable assurance" in favor of such finding.

One participant alleged that the Department's program does not meet the standards established by the Commission⁵¹ for the issuance of either an operating license or a construction permit for a power plant and, therefore, the Commission should not find confidence in the program. This allegation mischaracterized the issue before the Commission in this generic rulemaking. The Department is not applying in the Waste Confidence Rulemaking for authority to construct or operate a particular disposal or storage facility. The Commission is conducting the proceeding to make a generic judgment that is largely legislative in nature.

In making its findings in the proceeding, the Department cautioned the Commission to be careful to avoid devoting undue attention to sweeping and unsupported contentions about critical "gaps" in technical knowledge or allegations that program difficulties never will be overcome. Unsupported allegations should not give rise to presumptions. It was noted that the Supreme Court in *Vermont Yankee Nuclear Power v. Natural Resources Defense Council*⁵² indicated that it is incumbent upon participants in administrative proceedings "to structure their participation so that it is meaningful, so that it alerts the agency to the [participant's] position and contentions,"⁵³ especially when they are requesting the agency to embark on an explora-

50. See 10 C.F.R. §§ 50.1-73.80 (1980) (providing licensing requirements for at-reactor storage). Additionally, on November 12, 1980, the NRC added 10 C.F.R. part 72 to its regulations to cover the specific licensing requirements for the storage of spent fuel in an independent spent fuel storage installation. 45 Fed. Reg. 74693 (1980).

51. See 10 C.F.R. § 50.57(a) (1980); 42 U.S.C. § 2133(d) (1976); 10 C.F.R. § 50.35(a) (1980).

52. 435 U.S. 519 (1978).

53. *Id.* at 553.

tion of unchartered territory.

II. SUMMARY OF THE DOE POSITION

Throughout the proceeding, the Department has taken the position that (1) spent nuclear fuel from licensed facilities ultimately can be disposed of safely off-site; (2) disposal facilities will be in operation between 1997 and 2006; and (3) spent nuclear fuel from licensed facilities can be stored safely either on-site or off-site until disposed of ultimately.

Because any program for handling and storage of spent fuel must result ultimately in the safe and environmentally acceptable disposal of radioactive waste, the Department, in its initial statement, first discussed the issue of ultimate disposal. The discussion addressed the technical basis upon which a determination can be made that nuclear waste from licensed facilities can be disposed of safely. The Department described its focus on the use of mined geologic repositories⁵⁴ and issues that require resolution prior to the successful disposal of nuclear wastes. Also discussed was the plan, including environmental reviews under the National Environmental Policy Act,⁵⁵ that will lead to the actual construction of disposal facilities. The Department did not attempt to prove that safe disposal of these radioactive wastes, with the required approval of the appropriate regulatory authorities, can be achieved today. Rather, it was shown that disposal can be achieved within reasonable, specified times upon completion of DOE's current research development and site exploration programs.

Almost no technical uncertainties exist concerning safe and environmentally acceptable interim storage, which is primarily a responsibility of the electric utilities and which typically involves the use of water basins.⁵⁶ Some technical uncertainties re-

54. DOE's focus on deep geologic disposal was characterized at that time as an interim strategy pending completion of appropriate environmental reviews. See U.S. DEP'T OF ENERGY, FINAL ENVIRONMENTAL IMPACT STATEMENT ON MANAGEMENT OF COMMERCIALY GENERATED RADIOACTIVE WASTE (October 1980). In April 1981, the Department, after considering the benefits, impacts, and costs of reasonable alternatives, decided to adopt a programmatic strategy to develop mined geologic repositories for disposal of commercially generated high-level waste, while continuing to examine subseabed and very deep-hole disposal as potential back-up technologies. See 46 Fed. Reg. 26677 (1981).

55. 42 U.S.C. §§ 4321-4361 (1976).

56. Water basin, or water pool, storage consists of storing spent nuclear fuel in racks

main, however, in the disposal program.⁵⁷ These uncertainties are accounted for by providing features in the deep geologic disposal program that lead to a relative insensitivity to uncertainties. This is achieved through the application of appropriate site suitability criteria to diverse geologic environments; the provision of redundant, independent, natural, and engineered features to retard the movement of radionuclides; and the application of conservative engineering practices. Uncertainties, the Department noted, can be evaluated by considering the bounds of their worst potential impacts on performance of the entire disposal system.

By applying a conservative, step-by-step approach in the program, experience and information gained at each step will contribute to a reduction in uncertainties and provide a basis for proceeding to the next step. Even after the research and development is completed, however, residual uncertainties, smaller than those that now exist, will still remain. The Department's program and the ability to provide engineered barriers in a disposal system afford sufficient flexibility to accomodate these residual uncertainties in systems for the safe storage and permanent disposal of radioactive waste.

To demonstrate the Department of Energy's ability to understand and address the social, political, and institutional aspects of waste management, the Department presented its program plans and management structures. It also provided a description of both current and planned institutional arrangements that have been or will be established to enable the nation to address radioactive waste management problems in a manner that promotes cooperative relationships between the federal and state governments.

Recognition of the vital importance of the management of radioactive wastes in the last several years has caused a significant growth in the Department's program. This growth has required the establishment of a broadly based management struc-

generally positioned at the base of a pool of water. The water serves as a transfer agent to remove heat from the stored fuel and also provides radiation shielding. DOE STATEMENT OF POSITION, *supra* note 19, at IV-7.

57. Geologic disposal of high-level radioactive waste involves prediction of geologic and waste behavior over thousands of years. Without actual experience, a certain level of uncertainty enters into any predictions of such behavior.

ture in the areas of both research and development and institutional arrangements. The technical basis for the program has been substantially broadened. Additionally, scientific disciplines have been recognized as important and investigators from these fields are now active in the program. The examination of potentially suitable disposal sites has been expanded to encompass a variety of environments with diverse rock types. Extensive site selection work currently is being carried out in a number of different locations around the United States and work on new regions is to begin shortly. The bases for decisions are now being established both internally by the Department of Energy and externally by the responsible regulatory authorities, namely, the Nuclear Regulatory Commission⁵⁸ and the Environmental Protection Agency.⁵⁹ The development of specific criteria and standards against which to measure the progress of the technical program and toward which responsible technical participants in the program can focus their efforts will provide additional impetus to the successful completion of the required technical work. Finally, use of a conservative approach will ensure that any technical uncertainties that might remain will not diminish confidence in the successful operation of storage and disposal facilities that meet the required standards set forth by independent regulatory authorities.

The expansion of the current waste disposal program is based on work conducted for more than twenty years. Investigation of geologic disposal as a means to provide safe isolation of radioactive wastes has been under way since 1957 when the initial recommendation that such disposal should be considered as a primary candidate was made by a committee of the National Academy of Sciences.⁶⁰ Although many of these prior investigations may not have been structured strictly within the format now prescribed for the DOE program, the preliminary work has been essential in understanding the most important considerations and in guiding the future direction of the program. The results of the prior investigations now are being integrated into

58. See, e.g., 46 Fed. Reg. 13971 (1980); 45 Fed. Reg. 31393 (1980).

59. See 43 Fed. Reg. 53262 (1978).

60. See COMMITTEE ON WASTE DISPOSAL OF THE DIVISION OF EARTH SCIENCES, NATIONAL ACADEMY OF SCIENCES, THE DISPOSAL OF RADIOACTIVE WASTE ON LAND (NAS-NRC [National Research Council] Pub. No. 519, 1957).

the broader DOE program.

The Department showed that implementation of the waste disposal strategy will result in the establishment of operating geologic repositories in the time range of 1997 to 2006. The exact date of operation depends upon a number of variables that will be determined only by the outcome of existing programs. If the examination of potential repository sites in a variety of geologic environments with diverse rock types indicates that a site in bedded or dome salt is preferred for the initial repository, the reduced construction time possible in salt and an assumption of licensing schedules recently forecast by the NRC staff⁶¹ could lead to the operation of a repository as early as 1997. On the other hand, if further examination indicates that a repository in hard rock, such as granite, would be preferable, construction in that medium would require more time before the operation of a repository could begin. Allowances for other uncertainties, such as the time required for licensing proceedings or for collection of more extensive preliminary data than currently planned prior to the licensing proceedings, could result in initial repository operation as late as 2006.⁶²

The Department of Energy concluded that the waste disposal program described in its statement provides the basis for a finding that spent nuclear fuel from licensed facilities will be disposed of safely within a reasonable time. While there is no technical reason that storage at reactor sites cannot be continued for extended periods of time, shortage of storage capacity will require additional storage facilities. The technical basis for construction of additional storage facilities for spent nuclear fuel

61. The NRC staff indicated in a meeting with DOE representatives on October 4, 1979, that the staff estimates 48 months for review of a construction authorization application. DOE STATEMENT OF POSITION, *supra* note 19, at III-35.

62. The Department recently has announced that the National Waste Terminal Storage Program has reached a point that detailed evaluations of a limited number of potential locations can be accelerated. The NRC has promulgated procedural licensing regulations requiring exploratory shafts to be sunk to allow underground investigation of sites prior to their consideration for licensing. 46 Fed. Reg. 13971 (1981). By focusing its attention on sites most likely to be qualified, the Department intends to be able to sink exploratory shafts at three possible sites within the next few years. Evaluation of these sites will allow the designation of one site at which an unlicensed testing and evaluation facility can be constructed with a capability to accept several hundred packages of radioactive materials. This testing and evaluation disposal facility will be used to gain experience in waste emplacement and information for final decisions to construct full-scale licensed repositories within the range of time set forth in DOE's Statement of Position.

and capability to provide such facilities are available now. The Department of Energy, therefore, concluded that spent nuclear fuel from licensed facilities can be both stored and disposed of safely off-site.

The remainder of this Article will describe the Department's principal comments on disposal. It also will discuss some of the arguments presented by other participants and indicate how these were answered by the Department in its cross-statement.

III. ADDRESSING THE ISSUE OF ULTIMATE DISPOSAL

As noted above, DOE, in its initial statement, first discussed disposal of unprocessed spent fuel. The discussion of disposal was presented first because the requirements for spent fuel storage are related directly to the availability and capacity of disposal facilities. The amount of spent fuel that can be disposed of and the schedule for disposal will affect the storage requirements. After discussion of disposal, storage was reviewed. Finally, the initial statement addressed the integration of the disposal system and the storage system and provided examples of how the two systems relate to each other.

A. *Technical Objectives for Disposal*

The goal of safe disposal is the effective isolation of radionuclides from the environment in a safe and environmentally acceptable manner. The Nuclear Regulatory Commission will judge the adequacy of any high-level waste disposal system by predetermined criteria. Although the Department is using conservative criteria and methods, there is a recognized need to ensure that the Department's approach will be compatible with that required by the Commission and be amenable to timely Commission review. Because final NRC technical regulations are not yet available,⁶³ the Department has developed proposed generic performance objectives, based upon a review of a wide variety of publications on the subject. The Department suggested that these objectives will be similar to those that the Commission can be expected to promulgate and that they should be

63. The NRC has given notice of a proposed rulemaking to develop technical criteria for regulating geologic disposal of nuclear waste. See 45 Fed. Reg. 31393 (1980).

used in the Waste Confidence Rulemaking to evaluate the DOE program. The generic performance objectives that DOE proposed should be met by any disposal system were summarized as follows:

1. Containment⁶⁴ should be virtually complete during the period dominated by fission product decay.

2. Isolation⁶⁵ from the accessible environment should be effective for at least 10,000 years, and reasonably foreseeable events should not produce consequences greater than normal variation in background radiation.

3. The operational phase of a waste disposal system should be as safe as for presently licensed nuclear fuel-cycle facilities.

4. Environmental impacts should be mitigated to the extent reasonably achievable.

5. Conservative design⁶⁶ and evaluation should be applied to waste disposal systems to compensate for any residual uncertainties.

6. Acceptable performance should be based on methods reasonably available and should not depend upon continued maintenance or surveillance for unreasonable times into the future.

7. Concepts selected for implementation should be independent of nuclear industry trends (such as its future size or resolution of specific fuel cycle and design issues) and be compatible with national policies.

To implement the seven objectives for any of the alternative disposal methods, the Department has adopted a requirement for conservatism in design and operation. This requirement is satisfied by (1) continual reassessment of the state of knowledge to assure, step-by-step, that designs and plans are supported by the best and latest data; (2) use of multiple barriers to isolate waste from the biosphere by a series of relatively independent and diverse barriers that would not be subject to common fail-

64. "Containment" means confining the radioactive wastes within prescribed boundaries, such as within a waste package. See DOE STATEMENT OF POSITION, *supra* note 19, at I-15.

65. "Isolation" means segregating waste from the biosphere to the extent required to meet applicable radiological performance objectives. *Id.*

66. In this context, conservatism means taking a course of action in design, analysis, or operation that would tend to overestimate adverse consequences, underestimate mitigating factors, or otherwise provide large margins of safety against undesirable outcomes. *Id.* at II-21.

ure; and (3) use of design and operating margins to compensate for uncertainties in design and knowledge of natural systems.

Several participants challenged the Department's position concerning the times required for waste "containment" and "isolation." The underlying thrusts of their allegations were that the Department's proposed objectives do not coincide with draft NRC technical criteria,⁶⁷ the Department's numerical objectives are without basis, and postulated long-term releases warrant longer periods of control. After further elaborating on the basis for its proposed containment and isolation objectives, the Department in its cross-statement showed that its containment objective is consistent with the intent of NRC staff criteria, and that some participants' assertions that the required isolation period should be longer do not properly consider the hazard that the waste actually will represent over this longer time period.

The periods of concern are much shorter than some have suggested. When spent fuel first is placed in a repository its radioactivity content, and therefore its toxicity, will be at its highest point while in the repository. However, the radioactivity of spent fuel will diminish significantly within the first several hundred years, primarily because of the decay of fission products. (This is the so-called period "dominated by fission product decay.") During this period, the wastes should be "contained" tightly within the package in which they were placed because they then pose their greatest threat to public health and safety due to the greater thermal driving forces and radiotoxicity. After this period, the radioactive elements will be significantly reduced in activity and be more nearly like natural elements found in the earth today. At that time, they become of less concern because the risk to the general public associated with the wastes will be very small and, in fact, similar to risks associated with elements that already have existed in concentrated ore bodies for all the years people have lived on Earth. Nevertheless, the Department acknowledged that, because they could pose some threat to public health and safety, the wastes should be "isolated."

A number of participants contended that the Department's disposal program places undue reliance on scientific break-

67. See 45 Fed. Reg. 31393 (1980).

throughs and ongoing research. They based their presentations largely on quotations from various documents that identified claimed research needs and technical uncertainties. The Department had demonstrated, however, that scientific breakthroughs are not required to successfully implement geologic disposal; that, because of the existing depth of technical knowledge, program diversity, and flexibility, undue reliance is not placed on research efforts; and that the program's conservative approach will, in fact, lead to the safe disposal of radioactive waste despite residual uncertainties that always will remain. The Department's position is strongly supported by several other participants in the Waste Confidence Rulemaking and by the Interagency Review Group on Nuclear Waste Management.⁶⁸ Arguments to the contrary are based on incorrect interpretations or misunderstandings of the Department's conservative approach.

B. Disposal Alternatives

A number of disposal alternatives⁶⁹ were outlined in the DOE statement. The use of mined geologic repositories, however, has since been adopted as a programmatic strategy, following completion of environmental reviews conducted by the Department. Prior to the completion of these environmental reviews, no decision or commitments that would foreclose alternatives could be made, but geologic repositories were said to appear most likely to meet all of the proposed performance objectives. It is believed that locations within the Earth's crust where significant change requires geologic time periods to occur and which appear to provide negligible hydrologic transport potential⁷⁰ are suitable for the permanent isolation of nuclear waste.

68. See INTERAGENCY REVIEW GROUP ON NUCLEAR WASTE MANAGEMENT, REPORT TO THE PRESIDENT (1979).

69. The alternative disposal technologies discussed by DOE are: (1) mined geologic disposal; (2) subseabed disposal; (3) very deep hole disposal; (4) rock melting disposal; (5) island disposal; (6) ice sheet disposal; (7) deep well injection disposal; (8) space disposal; (9) waste partitioning and transmutation; (10) chemical resynthesis. DOE STATEMENT OF POSITION, *supra* note 19, at II-27 to -42. These alternatives are discussed in more detail in U.S. DEP'T OF ENERGY, FINAL ENVIRONMENTAL IMPACT STATEMENT ON MANAGEMENT OF COMMERCIALY GENERATED RADIOACTIVE WASTE (Oct. 1980). See note 54 *supra*.

70. DOE STATEMENT OF POSITION, *supra* note 19, at II-28.

The alternatives of subseabed disposal or disposal in very deep holes appear more amenable to being assessed with reasonably available methods (objective 6), and the Department said that these alternatives appear sufficiently promising to warrant continued examination to assess their potential for later development.

C. Natural and Man-Made Systems of Mined Geologic Disposal

The mined geologic disposal system, as described by the Department, will incorporate both natural and man-made systems which are composed of three major subsystems: the natural system associated with the site, the waste package, and the repository. Together they will provide multiple barriers between the emplaced waste and the human environment. The natural system—the natural geologic and hydrologic features of the repository site, as well as the remoteness of the repository (in terms of depth below the surface and distance from water supplies)—will provide barriers for isolating nuclear waste from people and their environment. Engineered barriers incorporated in the waste package and repository system will provide containment of the waste, delaying the time and retarding the rate of release of radionuclides into the far-field environment.

1. *The Natural System.*—The natural system for waste isolation consists of the repository host rock, surrounding geologic formations, and the associated hydrologic environment. It is discussed in the context of a “near field” and a “far field.” The near field provides both containment and isolation for the emplaced waste: containment by minimizing the likelihood that circulating ground water will contact the waste package, and isolation by ensuring that any migration of radionuclides will be very slow. The prime function of the far field is to ensure that, if radionuclides were released from the near field, ensuing migration to the biosphere would be of sufficient duration to satisfy the second generic performance objective of isolation for at least 10,000 years.⁷¹

A six-point summary by DOE of natural systems investigations shows that currently (1) the scope of technical information

71. See text accompanying note 65, *supra*.

required for evaluating natural systems and the role that natural systems can play in providing barriers for containment and isolation are known; (2) required characterization techniques are available and many represent the state of the art; (3) the need for additional improvement in predicting performance of fractured, and perhaps water-bearing, rock masses has been recognized; (4) site identification programs, some well-advanced, are being conducted in a number of regions and with a number of host rocks, including basalt, granite, salt, and tuff; (5) investigations to date strongly suggest that acceptable natural systems exist that will meet the performance objectives; and (6) the diversity of media under evaluation, the large number of potentially suitable sites contained in the areas and regions being studied, and the ability to successfully screen for sites using criteria and the available performance assessment techniques will result in identifying, qualifying, and licensing repository sites.

2. *The Man-Made Systems.*—The man-made systems are made up of three basic functional components: the waste-package system, the repository system, and human-intrusion barriers.

The waste-package system includes everything man places in the repository waste emplacement hole, including the waste form, canister, overpack, and backfill. These various package system components will be used to reduce overall technical uncertainties by virtue of their conservative engineering design and by providing barriers in addition to those provided by the host rock and surrounding strata.

Several participants asserted that the interactions of wastes and potential host rocks are not sufficiently understood to reach a finding of confidence. There is, however, a large body of information already in the record on thermal and radiation effects on various geologic media and on waste package interactions to counter this suggestion. Contrary to many assertions, data on the performance of spent fuel in geologic environments is being developed. There are, in fact, many bodies of data pertinent to the performance of waste package components, such as canister materials and backfill materials, under repository conditions. The Department submitted that sufficient information is available to recognize the benefits of engineered barriers and to acknowledge their feasibility. Moreover, other participants' assertions that knowledge of waste package performance is inadequate did not consider waste package and repository design

alternatives that can be tailored to provide a conservatively designed system that will incorporate the natural features of a specific site. They also failed to recognize here, as elsewhere in their arguments, that the impact of many individual processes that might affect waste packages can be conservatively accounted for in assessments of system performance and through the use of design and operating margins.

Extensive testing and development studies have been conducted for several years on the waste package and specific components of the package. While acknowledging these studies are not complete, the Department has said that results to date indicate that the waste packages can be designed and fabricated to provide virtually complete containment of the wastes during the period dominated by fission product decay.⁷²

The repository system provides for the receipt, inspection, transfer to the underground emplacement, and containment after closure of radioactive waste. The system also must contribute to the long-term isolation of the waste by limiting adverse impacts on the natural isolation system during development of the repository, and to the extent possible, by enhancing isolation through the use of engineered barriers. Thus, activities involving (1) the introduction of heat and radiation generated by the waste, (2) the excavation of underground disposal areas, and (3) the introduction of exploration boreholes and shafts, will be conducted to minimize any adverse impact on the integrity of this natural isolation system. Thermal impacts will be minimized by limiting the thermal loading, or the concentration of thermal energy per unit of repository space, and thus the temperatures in the repository. Migration of radionuclides will be restricted by the use of sorptive backfill materials. Impacts of repository excavation on structural stability will be limited by using low extraction ratios, highly developed and widely applied excavation techniques, and the backfilling of rooms and tunnels.

Human intrusion barriers, the third component of man-made systems, are provided so that the waste will be unaffected by future activities of man. These barriers are intended to meet two objectives: reduction of the likelihood of human-induced releases and mitigation of the consequences if human-induced re-

72. DOE STATEMENT OF POSITION, *supra* note 19, at I-17. See text accompanying note 64, *supra*.

leases occur. Although work is just beginning in this area and there is much to be learned, DOE indicated that it is reasonable to conclude that the likelihood of future human activities of a nature that could adversely affect the integrity of the repository can be reduced to an acceptably low probability through the use of appropriate protective measures. The impact of any such future activities, were they to occur, could be adequately mitigated by the multiple natural and man-made barriers included in waste disposal systems.

D. Assessing Safety Performance

Consideration of mined geologic repositories as a disposal method requires an examination of the methods of safety analysis in use and to be used to determine whether requirements can be expected to be met by repository components. As indicated by DOE, this involves assessing performance both in the long-term and during the period the repository is in operation.

1. *Long-Term Performance.*—Performance assessment methods have been developed to analyze the disposal system after the waste has been emplaced and the repository has been sealed. These methods analyze the combined effects of several phenomena that might affect the disposal system: natural events and processes, human actions, and impacts exerted by the waste and the repository.

Several participants asserted that methods for assessing the long-term performance of mined geologic disposal systems are inadequately developed to establish confidence.⁷³ They appeared to believe that no assessments can be made unless all details of every process can be accounted for and that every physical and chemical phenomenon must be completely understood, regardless of its significance. The Department asserted, as did several other participants, that scientists, in fact, can apply scientific judgment and analytical techniques to identify those phenomena that are truly significant; by using conservative values of input data, scientists can establish an upper bound on the effects of phenomena not completely understood.

Major contentions raised by participants relative to reposi-

73. See, e.g., Sheldon, *Nuclear Waste: The Problem Remains Unburied*, 32 S.C.L. REV. 911, 919 (1981).

tory performance were that thermal effects are not adequately understood; borehole, shaft, and backfill technology is not adequately developed; retrieval is not properly addressed and may not be possible in some media; abandoned sites may not be adequately restored; post-closure monitoring is not adequately addressed; and potential human intrusion may disqualify many geologic disposal sites. Many such allegations do not account for technical progress in recent years, ignore much of the information previously set forth in the Department's initial statement, and misinterpret technical documents that the participants themselves had referenced. Since the mid-1950's many geologic and environmental studies have been conducted to provide the technical and scientific basis for the design, construction, and operation of deep, underground repositories for radioactive wastes.⁷⁴ A broad spectrum of agencies and organizations has sponsored this research. Results indicate that a mined geologic repository can be built and operated safely with minimal effects on people and their environment.

Several participants asserted that the geosciences are not sufficiently advanced to identify an acceptable rock medium or specific site for mined geologic disposal.⁷⁵ To counter these assertions, the Department described the opinions of many eminent scientific peer review groups, the body of information on geologic exploration techniques, the Department's research on waste/rock interactions, the very stability and integrity of many geologic formations, and the methods and associated results from assessments performed in concert with the siting process. Geologic processes were shown to lend themselves to scientific evaluation. The Department noted that since it is possible to bound the effects of potential phenomena over long periods of time, perfect knowledge of every process is not required to make decisions about site suitability. Further, contentions regarding the viability of each of the media under current investigation ignore existing information and focus instead on minor resolvable issues. Sweeping generalizations about the unacceptability of a specific rock medium were shown not to be based on substantive information.

74. See studies and papers cited throughout DOE STATEMENT OF POSITION, *supra* note 19, Part II (April 15, 1980).

75. See, e.g., Sheldon, *supra* note 73, at 921-24.

Because the disposal system contains components that have complex interactions with one another and because its performance for long periods must be predicted, the Department recognized the necessity of using mathematical models to analyze the system.⁷⁶ Laboratory, bench-scale, and *in situ* tests are underway or planned to assist in verifying modeling predictions. Suggestions by some participants that required technology is not well-advanced were answered by pointing out the availability of many working, sophisticated models.

The use of these continually improving computer models, along with the continually improving body of experimental data, will permit the performance assessments to be done more completely and with increased confidence. These assessments will be important in site selection, system design, and licensing. The models have been used to assess the performance of disposal systems and have demonstrated that they can analyze the important phenomena. Because the development and verification of models and the gathering of data describing sites are incomplete, these assessments have used conservative data derived from laboratory and field measurements. They have demonstrated that the models have been developed sufficiently for use with complex systems. These studies also have predicted the consequences of releases of radionuclides from repositories far in the future. The vast majority of possible disposal-system conditions would not deliver any measurable doses to people.⁷⁷ Some possible but unlikely phenomena, such as ground water flow directly through repositories, could deliver radiation doses that would be a fraction of the doses delivered by natural background radiation. The analyses performed to date give no indication

76. The Department described how those computer models are developed, verified, and applied to gain confidence that the long-term performance of the disposal system will be acceptable. The development and verification of models of single phenomena required for analyzing the long-term performance of geologic disposal systems are well advanced, and these models can now be routinely used. Even so, the Department noted that the development and particularly the verification are continuing. The development and verification of models that analyze several phenomena together are moderately advanced, and some of these models can now be routinely applied.

77. The use in current analytical models of extremely conservative assumptions for leach rates, radionuclide sorption, modes and rates of radionuclide migrations, and probability determinations of geologic events has indicated that mined geologic disposal will limit consequences to levels that will be acceptable in terms of both human impact and environmental consequence.

that a geologic disposal system, designed and constructed according to the requirements described by the Department, cannot safely isolate radioactive waste.

2. *Operational Phase Performance.*—Assessing the performance of the repository during the operational phase does not require the special methods of long-term performance assessment, because the operations are at least similar to those in other common systems now in use. For example, the Department pointed out that excavation of storage rooms and packing and handling of waste containers are not too different from operations currently being performed. Adequate methods required for safety analyses are currently available. Satisfactory design, construction, and operation can be achieved. The operational phase activities can be shown to be comparable in safety to those of existing, licensed nuclear fuel-cycle facilities.

E. Overall Feasibility and Effectiveness of Mined Geologic Disposal

The Department has submitted that a mined geologic disposal system can meet the goal of providing the effective isolation of radionuclides from the environment. Some general observations with respect to various participants' assertions reinforce DOE's position. As the Department noted in its cross-statement, the participants raised no new technical issues. Each of the issues raised was addressed in the Department's statement of position or is being addressed by current research. Also, many of the allegations were either irrelevant or did not recognize the extensive body of work that has been undertaken over the last several years. Finally, many of the participants emphasized the unknown, without explaining why they believed these uncertainties to be of particular significance.

On the other hand, DOE and some other participants provided ample evidence that, through ongoing research and the use of a conservative approach, residual uncertainties and gaps in knowledge can be accounted for. In addition, the significance of any uncertainties with respect to specific barriers will be limited because of the fact that no one barrier is critical to isolation or containment. Furthermore, DOE's conclusions with respect to overall feasibility did not rely on scientific breakthroughs or place undue reliance on the outcome of any of its research and development programs. The Department laid out comprehensive

proposed performance objectives⁷⁸ by which a waste management system can be judged and asserted that compliance with those objectives, coupled with the diversity and flexibility inherent in its program, provides confidence that all relevant regulatory and statutory requirements will be met.

The Department also noted agreement on the issue of overall technical feasibility by at least one participant that nonetheless challenged the DOE's summary position.⁷⁹ The Natural Resources Defense Council stated in its statement of position:

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. The demand placed on DOE and the NRC is not to show that isolation can be achieved, but that it both *can and will* be achieved, within the requisite time period.⁸⁰

In short, the Department asserted that the Commission should dismiss as an issue the question of whether there now exists a sufficient scientific and technical basis for developing safe, environmentally acceptable facilities for waste disposal. Evidence to support the conclusion that an ample basis does exist was provided in the Department's submissions and was backed by the statements and cross-statements of many other participants.⁸¹ No technical basis has been shown for altering the De-

78. See text accompanying and following notes 64-66, *supra*.

79. See U.S. DEP'T OF ENERGY, CROSS-STATEMENT ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE at III-12 (Sept. 5, 1980) (hereinafter cited as DOE CROSS-STATEMENT).

80. N.R.D.C STATEMENT OF POSITION, *supra* note 45, at 9 (emphasis in original).

81. See, e.g., AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE (June 23, 1980); AMERICAN NUCLEAR SOCIETY, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE (July 3, 1980); ASSOCIATION OF ENGINEERING GEOLOGISTS, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE (Aug. 1, 1980); ATOMIC INDUSTRIAL FORUM, INC., STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE (July 7, 1980); GENERAL ELECTRIC COMPANY, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE (July 1, 1980); NEIGHBORS FOR THE ENVIRONMENT, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE (July 4, 1980); U.S. GEOLOGICAL SURVEY, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NU-

partment's conclusions that safe, environmentally acceptable disposal facilities will be available when needed.

IV. IMPLEMENTATION OF DOE'S PROGRAM FOR ESTABLISHING MINED GEOLOGIC REPOSITORIES

Many participants in the Waste Confidence Rulemaking contend that, even putting technical problems aside, the NRC should not find "confidence" in DOE's schedules for its waste management program because of unresolved issues of program implementation, sometimes referred to as "nontechnical" or "institutional" issues.⁸² The Department agreed that the resolution of difficult nontechnical problems is essential to the success of its program and maintained that adequate activities are now under way to permit completion of the schedules described in the DOE submissions in the proceeding.⁸³

The Department's waste disposal program focuses on developing repositories that will be available in an appropriate time frame and at a reasonable cost.⁸⁴ To accomplish this goal, the Department has put into place a management organization to address and resolve the technological, societal, economic, regula-

CLEAR WASTE (July 7, 1980); UTILITY NUCLEAR WASTE MANAGEMENT GROUP-EDISON ELECTRIC INSTITUTE, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE (July 7, 1980). Aside from the general issue just discussed, some participants also questioned whether these technical issues can be resolved to the extent necessary within the estimated time frames. The Department discussed this in its statement of position and cross-statement by listing technology development activities to support the waste package, repository engineering, and site selection. None of the participants challenged these specific milestones. Rather, their positions appeared to be general judgments that certain technical issues or uncertainties will not be sufficiently resolved or narrowed in time to support the Department's schedules.

82. See, e.g., Sheldon, *supra* note 73, at 930-32.

83. The thrust of the position statements of some participants is that the NRC should concentrate its inquiry on whether disposal *will* be accomplished as opposed to whether it *can* be. See, e.g., MARVIN I. LEWIS, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE at 2 (July 10, 1980); NRDC STATEMENT OF POSITION, *supra* note 45, at 9-10 (July 7, 1980); STATE OF MINNESOTA, STATEMENT OF POSITION ON PROPOSED RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE at 4 (July 8, 1980); STATE OF NEW YORK, STATEMENT OF POSITION, *supra* note 37, at 15-17 (July 7, 1980). DOE specifically has submitted that its statements in the Waste Confidence Rulemaking demonstrate that (1) the techniques proposed to be used for disposal and storage *will* be safe and (2) they *will* be implemented in a time frame that is responsive to national needs. See DOE CROSS-STATEMENT, *supra* note 79, at I-9; text accompanying notes 79-81, *supra*.

84. See DOE STATEMENT OF POSITION, *supra* note 19, at III-1.

tory, and institutional factors that could have impacts on the timing and cost of ultimate disposal. The Department outlined the effective organization it has established consisting of headquarters and field office personnel supported by more than 2000 professional employees of contractors. This arrangement reflects valuable lessons learned from the past and brings experience from a broad spectrum of professionals, ranging from geoscientists and mechanical engineers to sociologists and political scientists.

A. Site Selection, Licensing, and Environmental Considerations

The schedule for the development of the first full-scale licensed repository depends on site selection with state consultation and concurrence and licensing for construction. These decisions are the focus of technical activities that must be conducted in cooperation with those agencies, organizations, and individuals outside of DOE that are part of the decisionmaking process.

The Department is in the process of identifying candidate sites at several locations and in different geologic media before recommending a specific site for the first NRC license application. The selection of candidate sites is based on a systematic process that considers all applicable factors and is conducted with involvement of state and local officials and the public. The Department's program leading to selection of a site consists of three phases: site exploration and characterization, detailed site characterization, and site selection.

The Department's site selection process is based upon a continual narrowing of the range of studies within a particular geologic medium. Initially, studies of a candidate medium are conducted on a national scale. Then particular regions are identified for further study. From the regional studies, candidate areas of up to 1000 square miles are identified. These areas are narrowed to locations, and from the locations acceptable sites will be selected.

The Department described the regional and area characterizations now under way for various geologic media, including dome salt and bedded salt, basalt flows, and volcanic tuff. Efforts have been initiated to identify regions containing other media and other geohydrologic systems. The Department indicated it plans to identify multiple sites with diverse rock types in the

next few years.⁸⁵ The DOE approach includes consideration of regulatory factors, environmental factors, the necessity of achieving public acceptance, and the need to meet site qualification criteria.

After site selection, the second major decision that can affect the repository schedule is licensing. The NRC has the statutory authority to license facilities used primarily for the receipt and storage of high-level radioactive wastes resulting from activities licensed under the Atomic Energy Act of 1954.⁸⁶ Accordingly, the availability of regulatory procedures and requirements can have an impact on the schedule for a disposal system. Before a license application is submitted, the Department expects to consult with the NRC staff about field exploration activities so that the integrity of a potential site is not adversely affected.

Existing knowledge of licensing requirements as obtained from draft and proposed rules and communication with regulatory agencies has allowed the Department to make a forecast of the effects licensing activities will have on the schedule. Based on the existing information, estimates were made of the amount of time that will be required for licensing. The current lack of final regulatory standards for disposal was shown not to cause significant delay in the program by those participants that attempted to make such a delay an issue in the Waste Confidence Rulemaking. The Department's program of research and development is sufficiently broad-based and conservative to encompass the requirements of evolving disposal criteria. The Department demonstrated that its proposed performance objectives for disposal⁸⁷ will not be inconsistent with any standards promulgated by the Commission or by the Environmental Protection Agency. (Regulatory standards for storage, on the other hand, already are in place.⁸⁸).

Environmental considerations also may influence the schedule of repository construction. The National Environmental Policy Act,⁸⁹ as implemented by the regulations of the Council on

85. See note 62, *supra*.

86. 42 U.S.C. § 5842(3) (1976).

87. See text accompanying and following notes 64-66, *supra*.

88. See note 50, *supra*.

89. 42 U.S.C. §§ 4321-4361 (1976 & Supp. I 1976, Supp. II 1978, Supp. III 1979).

Environmental Quality (CEQ)⁹⁰ and the DOE guidelines,⁹¹ requires that potential environmental consequences be considered in Department planning and decisionmaking. Using the DOE guidelines and the CEQ regulations, the Department developed a draft NEPA implementation plan for mined geologic disposal, which is part of the overall Department planning and decision-making process. The Department said the environmental impact of all reasonable alternatives will be considered at each stage of the decisionmaking process.

1. *Coordination of federal activities.*—In its role as lead agency for the management and disposal of high-level radioactive wastes, the Department noted in its initial statement that it also is preparing, with cooperation of other cognizant federal agencies, a detailed national plan for nuclear waste management. It includes many activities specifically recommended by the Interagency Review Group on Radioactive Waste Management so that other agencies will give support to the Department activities when it is required. The ability to draw on the resources of these organizations and to obtain meaningful assistance will greatly enhance the ability of the Department to meet major milestones. Some participants, nevertheless, questioned whether adequate cooperation can be achieved among all the levels of the federal government, particularly whether the federal government will be able to pass necessary legislation, provide adequate funding, and coordinate activities of the various agencies.⁹²

The Department showed in its cross-statement that, in fact, Congress and the executive branch agree on the ultimate goal of the waste management program, although specific elements of a program designed to meet this goal are still under consideration. The Department emphasized that Congress and the executive branch are actively addressing the resolution of remaining issues and that necessary legislation and continued provision of the program funds will be forthcoming. Furthermore, it was shown that the current program has been formulated with input from a broad range of institutions, demonstrating a national resolve to solve waste problems in a safe and environmentally acceptable

90. 40 C.F.R. part 1500 (1980).

91. 10 C.F.R. part 711 (1979).

92. For a discussion of the issue of intergovernmental coordination for a federal waste disposal program, see Hart, *supra* note 26, at 677-717.

manner and without further delay.

In both its statement of position and cross-statement, the Department demonstrated that the activities of multiple federal agencies are being coordinated. Other participants have not substantiated their claims that adequate coordination is not now taking place or will not in the future.

2. *Cooperation of State and Local Governments.*—Another broad set of issues raised by other participants concerned the ability of the federal government to secure necessary cooperation from state and local governments.⁹³ In this connection, some participants questioned the intent of the federal government to give state and local governments a role in the decision-making process, the availability and adequacy of mechanisms to incorporate state and local views, and the availability and adequacy of conflict resolution mechanisms.

The Department's cross-statement demonstrated that mechanisms to facilitate ongoing investigative work are in place, as evidenced by the work that is proceeding at multiple locations throughout the nation. The Department demonstrated that the current active participation by Congress, the executive branch, the State Planning Council on Radioactive Waste Management, and various state governments should be able to define the site selection process before a specific repository site is proposed. The Department also demonstrated in its cross-statement that sufficient time has been allowed for addressing and resolving concerns that may be raised by state, tribal, and local governments.

B. Consideration of Public Support, Scheduling, and Costs

1. *Public Concerns.*—Additional questions were raised about the Department's ability to address public concerns and thus win public confidence so that the waste program may go forward.⁹⁴ Specific concerns included the Department's ability to address perceptions of risk, mitigate socioeconomic impacts, and achieve equity in distribution of risks and impacts. The Department maintained that public perceptions of high risk in time

93. The broad issue of federal preemption of state laws regulating nuclear waste transportation and disposal is discussed at length in Jaksetic, *supra* note 22, at 801-24.

94. See, e.g., Sheldon, *supra* note 73, at 930-32.

will subside to match current scientific understanding and that public confidence will be gained through DOE's emphasis on safety, public education by credible public institutions, and the involvement of state and local officials at all phases of repository development.

The Department showed that it recognizes the importance of socioeconomic impacts and that it has instituted a program to assess them and to provide recommendations to Congress concerning methods of mitigation. The federal government, it was pointed out, has dealt successfully with such socioeconomic impacts at federal installations of similar size.⁹⁵ Furthermore, considerable time remains to allow the design of specific impact mitigation measures that might be required for high-level radioactive waste repositories.

Some participants' position statements also questioned the equity of imposing risks and impacts on people living near a repository or along transportation corridors and asserted that perceived inequities could impede repository siting. The Department recognizes that the equity of the siting of undesirable but necessary facilities for handling noxious or hazardous materials, radioactive or otherwise, is a growing concern to modern society. The Department submitted, however, that methods to deal with perceived inequities have been successfully applied for many types of facilities. The resolution of this concern will not require methods unique to radioactive waste management and will not lead to delay beyond the considerable time allowed in the Department's schedules.

2. *Scheduling*.—Another major concern was with the ability of the Department to meet its schedules. In particular, some participants questioned whether industry will provide necessary cooperation, whether adequate time has been allowed, whether the Department needs to consider more fully the availability of multiple repositories, and whether the Department adequately treats costs.

The waste management program is proceeding with the active assistance of industry. The Department believes the industry cooperation will continue. Schedules for disposal, in fact, provide considerable time for interaction with state and local

95. DOE CROSS-STATEMENT, *supra* note 79, at II-57 to -58.

governments, for public hearings, and for extended public interactions during both site selection and licensing and development. Finally, the Department maintained that repositories likely will be located in different regions of the country, that will not create problems that vary greatly from those of a single repository, and that the current program is structured to accommodate development of as many repositories as are needed.

Where the Department does not already own or control a proposed repository site, the acquisition of the land for the repository site must be considered in the schedule. Nonfederal land can be acquired by the Department for a repository site by purchase or condemnation following procedures already established.⁹⁶ Federal property controlled by other agencies may be acquired by transfer to the Department following procedures established by the General Services Administration⁹⁷ or by the Department of the Interior.⁹⁸

Skilled technical personnel will be required in the site exploration and characterization phase of the program, in the development of necessary technology, and in the design and construction phase of the repository. The design and construction expertise required to build a geologic repository currently is available in the United States. Operating expertise will be available by the time the repository is ready for waste emplacement. The repository development schedule thus should not be affected by the need for lead time to develop any needed expertise.⁹⁹

3. *Costs.*—DOE has considered all elements of waste management cost. This cost was shown in the Department's cross-

96. See U.S. Dep't of Energy, Notice 4300.1 (February 1979), as extended by U.S. Dept. of Energy, Notice 1321.77 (February 1980).

97. See 41 C.F.R. 101-47.203 (1980).

98. See 43 C.F.R. part 1600 (1980).

99. Although not strictly associated with the schedule to bring a repository into operation, the waste retrieval period and start of backfill both have an impact upon the time when a repository can become fully operational. During the initial repository operation period, the Department will verify the predictive capability of methods used to apply early geologic test data to the specific site and design configuration and will verify that no unforeseen phenomenon associated with actual waste emplacement is observed. Ample latitude is provided for methodical development including testing and evaluation. A high level of confidence concerning the integrity of the operation will be attained before backfilling will commence. Should retrieval of waste be necessary following the initiation of backfilling, DOE's waste management plans include rerouting the wastes to other facilities.

statement to represent a relatively small portion of the cost of the nation's electricity and is therefore not "prohibitive," thus satisfying the test the Commission has said it will apply in the Waste Confidence Rulemaking in considering whether a waste disposal model is realistically available.¹⁰⁰

C. Conclusions About Nontechnical Issues

Some of the participants attempted to use the foregoing "institutional" issues to support a logic for refuting the Department's conclusions. The general pattern used was summarized by the Department as follows:

1. Such Participants contended that institutional issues are important. They cited past instances when program activities have been slowed or halted because of such problems as (i) intergovernmental conflict in the waste program; (ii) State and local opposition to repository siting; and (iii) public perceptions of exceeding high repository risks.
2. Such Participants contended either (i) that the Department has not adequately understood and addressed these issues; (ii) that the Department has no plans for dealing with these issues; or (iii) that such plans as the Department does have lack substance and specificity.
3. Such participants contended that, at the very least, resolution of these issues will be time-consuming and that the Department has not made appropriate allowances in its schedules.

The Department agreed with other participants who said that the resolution of difficult nontechnical problems is essential to the success of the waste program and that in many past instances the federal government has not adequately addressed these problems. More recent events, however, show a clear recognition of these issues and how progress is being made to address them. This evidence includes the actions of the federal government to formulate a national policy with broad input from multiple institutions and the public, the establishment of the State Planning Council, and numerous examples of joint federal-state discussions and agreements. The Department specifi-

100. See 44 Fed. Reg. 61372, 61373 (1979). Regarding assertions that a cost estimate for the integrated system was needed, DOE noted that the NRC has stated specifically that this proceeding is not intended to examine a detailed cost estimate. *Id.* However, detailed cost estimates are being prepared by DOE.

cally did not contend that it now has all the answers. Indeed, further study and consultation with others is an important part of DOE's plans. It is evident from the information represented in DOE's statement of position and cross-statement that the results of study and consultation, as well as the Department's own experiences in working with states, localities, the public, and other federal agencies, are being successfully incorporated into the program.

Specific contingency times were set forth in the schedules in the Department's original position statement, and any specific contentions about these schedules were refuted in the DOE cross-statement. Although it is possible that resolution of these uncertainties will take longer than anticipated, the Department submitted that its estimates are reasonable. Other participants did not provide substantive information to support their claims to the contrary.

DOE recognizes that closer examination is needed to determine whether the alleged lack of specificity or substance in particular institutional plans and mechanisms is a threat to the program's success. For example, the Department indicated it is true that DOE does not have detailed "institutional" plans to conduct site investigations over the next few years. Nonetheless, it does have written understandings with several of the states involved, and these investigations are proceeding. Similarly, detailed plans have not been made for reaching siting decisions following the site exploration phases. But for such plans to be workable, they must be acceptable to the multiple institutions that must live by them. Accordingly, the Department observed that the important factor here is that these institutions be participants in their design, which they are. Through the efforts of the Department, the State Planning Council, individual state governments, and Congress, consensus on the essential elements of the process is developing and is likely to be embodied in legislation soon.¹⁰¹ It, thus, is appropriate that only a framework for consultation and concurrence exists at this time.

The Department concluded that perhaps the best assurance that these issues of program implementation will be resolved in a timely fashion lies in the will of the American people. It should

101. Legislative developments in the 96th Congress are discussed in detail in Hart, *supra* note 26.

be clear by now from the extensive record of the Waste Confidence Rulemaking, if not this Symposium itself, that American society views the problem of nuclear waste as a serious piece of unfinished environmental business that must be resolved without further delay. The Department observed that the public will hold its institutions accountable for expeditious, good-faith efforts to resolve their differences. Interagency disputes can, if necessary, be appealed to the President or governors. Intergovernmental disputes will yield either to negotiated resolution or to powers of law prescribed by the United States Constitution and exercised by the Congress. In short, the willingness and determination of citizens and voters that progress be made toward reasonable, equitable, and safe solutions creates confidence that nontechnical problems can and will be overcome. The Department suggested that, if the Commission publicly expresses confidence in the technical capability to isolate nuclear waste safely, many of the problems of program implementation stand to be greatly lessened.

V. INTEGRATED OPERATION OF THE STORAGE AND DISPOSAL SYSTEMS

The Department lastly considered the integration of the mined geologic repository and storage programs to demonstrate that an overall waste management program exists that is capable of handling, storing, and disposing of the spent fuel. While studies to optimize the integration of the system of federal disposal and utility storage have not been completed, a sample spent-fuel management scenario was analyzed. Variables considered included the capacity, receiving capability, and date of availability of geologic disposal facilities, storage availability and required capacity, and the transportation logistics for moving spent fuel. It was shown that the combined system of disposal and storage facilities will provide great flexibility to meet the need to balance technical conservatism, regional needs, and reactor operation requirements.

Some participants expressed concern about the logistics of transporting spent fuel,¹⁰² including the possibility that there

102. Transportation safety, as opposed to logistics, was not intended to be within the scope of the rulemaking proceeding. See note 17, *supra*.

will be an insufficient number of casks available to meet transport needs, the dependence on railroads for the bulk of the shipments, and the impact of the large number of shipments on local communities and receiving facilities. The Department showed that the requirements for shipping casks will be filled most easily with present casks and a modest program of cask construction readily within existing industrial capability. It also demonstrated that the nation's railroads can meet the program's transportation needs and that the number of shipments is not expected to be so large as to have a significant impact in local communities. The Department submitted that receiving facilities can be designed to accommodate the expected shipments.

In response to some participants' assertions that an integrated safety analysis was required, the Department showed that both the Department and the Commission, in fact, have conducted safety analyses and environmental impact analyses on the storage of spent fuel; the Department and the Commission have evaluated and reported on the safety aspects of transporting spent fuel, although this topic is outside the scope of this proceeding; and the Department is preparing a comprehensive evaluation of safety and environmental considerations related to disposal. The interactions among these three elements already have been analyzed at the shipping-receiving "interface," thereby providing a complete analysis of each component part of the system.

VI. SUGGESTED NRC FINDINGS

Based upon the information in its statement and cross-statement, the Department concluded that the Commission should 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 plans for establishing geologic repositories are 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;
4. Sufficient additional storage capacity for spent nuclear fuel from licensed facilities will be established; and

5. The disposal and interim storage systems for spent nuclear fuel from licensed facilities will be integrated into an acceptable operating system.

As indicated in the Notice of Proposed Rulemaking,¹⁰³ the Commission will use the findings of its Waste Confidence Rulemaking to determine to what extent issues of on-site storage of spent nuclear fuel need be considered in individual facility licensing proceedings. Having made these five findings, DOE concluded that the Commission 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.

VII. CONCLUSION—WHERE RULEMAKING STANDS TODAY

Following the submission of position statements, cross-statements, and “suggestions as to further proceedings,”¹⁰⁴ the NRC staff working group filed its report on January 29, 1981. The participants then were given an opportunity to submit another round of written comments. In comments filed on March 5, 1981, DOE concluded that the working group report generally had summarized accurately the voluminous record and identified adequately the range of issues in controversy in the Waste Con-

103. See 44 Fed. Reg. 61372 (1979).

104. The latter submissions were filed pursuant to the presiding officer's orders that the participants, by October 6, 1980, file “suggestions as to the nature and scope of further proceedings, additional areas of inquiry or further data or studies.” Order, *supra*, note 15; Waste Confidence Rulemaking, Order Extending Time to File Statements and Cross-Statements of Position (May 29, 1980), at 5. In its submission, the Department said it was evident that, in the period that started in October 1979, the participants had extraordinary and repeated opportunities to identify, examine, and comment upon issues related to nuclear waste storage and disposal. The participants had two opportunities to present their written views on disposal and storage in general and DOE's position in particular. Further, both the Department and the Commission went to great efforts to provide to the interested public both information and opportunity to participate in the Waste Confidence Rulemaking. For example, the Commission agreed to reproduce and serve the position statements and cross-statements of all participants. The Department and the Commission made large numbers of documents available at eleven locations around the country. Every issue that the participants were able to advance was the subject of ample written discussion. Thus, the Department concluded no useful purpose could be served by ordering that additional time and resources be committed to conducting further studies.

fidence Rulemaking.¹⁰⁵ Further, the Department agreed with the working group's conclusions that for most, if not all, of the issues identified the existing record of the proceeding was adequate and need not be supplemented. DOE also agreed with the working group's conclusion that not all issues raised by the participants are equally critical to a finding of "confidence." The Department submitted, moreover, that the items on which the report suggested further information was needed fell into the category of not critical to a finding of "confidence."¹⁰⁶

In its suggestions as to further proceedings dated October 6, 1980, the Department of Energy had submitted that its presentation in the Waste Confidence Rulemaking demonstrated the existence of an overall nuclear waste management program capable of handling, storing, and disposing of spent nuclear fuel from commercial power reactors. DOE also had said that the proceedings that had been conducted in the rulemaking since October 1979 had produced a comprehensive factual record more than sufficient to serve as the basis for a final NRC rule. In its com-

105. At the same time, the Department pointed out that the particular format chosen by the NRC working group did not always provide an accurate synopsis of information available in the record. Because the participants did not specifically address the issues as framed in the working group report, the working group's summaries of "positions" on particular issues had to be developed by referring to apparently related discussions in the various statements of the participants. DOE therefore strongly endorsed the statement of the working group that the summaries do not serve to substitute for, and should be used only as guidance to, the detailed record. The working group also failed to recognize the degree to which DOE's position statement and cross-statement were supported by literally hundreds of technical references (copies of which were submitted for the record) and to acknowledge the fact that positions taken by participants in their original statements in many cases were addressed in the various cross-statements submitted by DOE and other participants. In short, DOE urged that the NRC use the working group report only for indexing purposes and not as a substitute for the actual record developed in the Waste Confidence Rulemaking.

106. The working group report appeared to identify six areas in which it believed more information might be needed before the Commission closed the record. These were information about (1) the historical and projected expenditures in terms of manpower and monetary commitments to DOE's programs, (2) how "a score of geotechnical tests" are integrated into DOE's program, (3) technical subsurface data on basalt at the Hanford Site (a large federal reservation) in the State of Washington, (4) DOE's specific plans for retrievability of waste packages emplaced in a repository, (5) the alternative of indefinite storage of spent fuel, and (6) storage and disposal of severely damaged spent fuel. The Department indicated it is prepared to offer additional information on these points as may be required by the NRC, but said it believes that the proceeding should be brought to an orderly conclusion at the earliest possible time and that the record is adequate to do so now.

ments of March 5, 1981, the Department concluded that the NRC staff working group report only reinforced the Department's previous conclusions.

While the working group identified a few points on which it believed additional information may be "desirable," these points taken singularly or together are not critical to the Commission's finding of confidence in the proceeding. The Department has indicated it is prepared to offer additional information on these points as may be required by the Commission. However, the Department also has said that the Commission can evaluate the existing record in the Waste Confidence Rulemaking and use it as the basis for indicating how questions of the disposition of spent nuclear fuel will be addressed in individual NRC licensing proceedings.¹⁰⁷

107. In its Memorandum and Order of January 6, 1981, the Commission directed the presiding officer to submit his recommendations concerning further proceedings in the Waste Confidence Rulemaking following the close of the comment period on the working group report. Waste Confidence Rulemaking, Memorandum and Order (January 6, 1981). Therefore, the Department renewed its request of October 6, 1980, that the participants be given an opportunity to submit written comments on any proposed procedures for further written submissions or oral presentations before the Commission closes the record in the Waste Confidence Rulemaking. U.S. DEP'T OF ENERGY, COMMENTS ON REPORT OF NUCLEAR REGULATORY COMMISSION STAFF WORKING GROUP (March 5, 1981). More particularly, if it is decided that oral presentations would be appropriate, the Department reiterated that the Commission should establish strict time limits for such presentations. This would be most necessary to an orderly proceeding with so many participants and such a voluminous and complex record. It also would enable the Commission to hear each participant both in an efficient manner and in a time frame consistent with the Commission's dedication to its timely completion of this proceeding. *Id.*

