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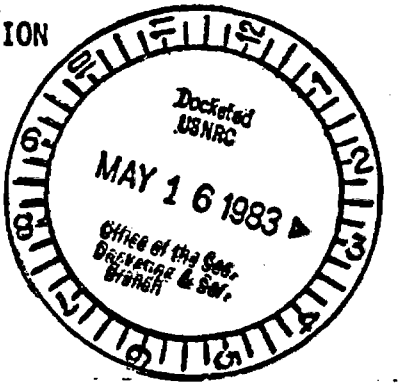
UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION



COMMISSIONERS:

Nunzio J. Palladino, Chairman
Victor Gilinsky
John F. Ahearne
Thomas M. Roberts
James K. Asselstine

In the Matter of

RULEMAKING ON THE
STORAGE AND DISPOSAL OF NUCLEAR
WASTE

(Waste Confidence Rulemaking)

PR-50,-51 (44 FR 61372)

DECISION

1.0 INTRODUCTION

1.1 Initiation of the Waste Confidence Rulemaking Proceeding

In response to the remand of the U.S. Court of Appeals for the District of Columbia Circuit (State of Minnesota v. NRC, 602 F.2d 412 (1979)), and as a continuation of previous proceedings conducted in this area by NRC (44 Fed. Reg. 61372), the Commission initiated a generic rulemaking proceeding on October 25, 1979. In its Notice of Proposed Rulemaking the Commission stated that 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." The Commission recognized that the scope of this generic proceeding would be broader than the Court's instruction, which required

the Commission to address the questions of whether off-site storage for spent fuel would be available by the expiration of reactor operating licenses and if not, whether spent fuel could continue to be safely stored on-site (44 Fed. Reg. 61373).

However, the Commission believed that the primary public concern was whether nuclear waste could be disposed of safely rather than with an off-site solution to the storage problem per se. Moreover, as stated in the Federal Register Notice on October 25, 1979, the Commission committed itself to reassess its basis for reasonable assurance that methods of safe permanent disposal of high level waste would be available when they are needed. In conducting that reassessment, the Commission noted that it would "draw upon the record compiled in the Commission's recently concluded rulemaking on the environmental impacts of the nuclear fuel cycle (44 Fed. Reg. 45362-74 [August 2, 1979])" (44 Fed. Reg. 61373).

The Department of Energy (DOE), as the lead agency on nuclear waste management filed its statement of position (PS) on April 15, 1980. Statements of position were filed by 30 participants by June 9, 1980, and were followed by cross statements (CS) from 21 of the participants by August 11, 1980.

1.2 Establishment of the Working Group

On May 28, 1980, the Commission directed the staff to form a Working Group to advise the Commission on the adequacy of the record to be compiled in this proceeding, to review the participants' submissions and identify issues in controversy and any areas in which additional information would be needed. The Working Group submitted a report to the Commission on January 29, 1981. The report summarized the record,

identified key issues and controversies, and commented on the adequacy of the record for considering the key issues. The participants were invited to submit comments on the adequacy of the Working Group's summary of the record and its identification and description of the issues. Such comments were made by 20 participants by March 5, 1981.

1.3 Commission's Order for Oral Presentations

The Commission found limited further proceedings to be useful to allow the participants to state their basic positions directly to the Commissioners and to enable the Commissioners to discuss specific issues with them, in particular new developments which included: (1) the Administration's announcement[1] of its policy favoring commercial reprocessing of spent fuel and instructing the Secretary of Energy to proceed swiftly toward deployment of a means of storing and disposing of commercial high-level radioactive waste, and (2) the submission of information to the Presiding Officer in this proceeding, by DOE on March 27, 1981, concerning the DOE decision to "discontinue [its] efforts to provide federal government-owned or controlled away-from-reactor (AFR) [spent fuel] storage facilities." The participants were asked to comment on the significance to the proceeding of issues, particularly institutional concerns, resulting from these policy changes and to comment on the merits of DOE's new projection of spent fuel storage requirements and on the technical and practical feasibility of DOE's suggested alternative storage methods.

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[1] Presidential Nuclear Policy Statement, October 8, 1981.

The Commission, therefore, in its Second Prehearing Memorandum and Order, dated November 6, 1981, provided for additional written and oral presentations to be made by the participants, consolidated into groups, identified as: (a) federal government, (b) state and local participants, (c) industry, and (d) public interest groups. Prehearing statements (PHS) were provided by the consolidated groups, as well as by individual participants. The oral arguments were presented to the Commissioners on January 11, 1982.

The extensive record generated in these written and oral submissions was used by the Commission in reaching its decision regarding the safe storage and disposal of spent fuel and nuclear waste. In addition, the Commission has taken into account the recently enacted Nuclear Waste Policy Act of 1982. The decision is summarized as five Commission findings presented in Section 2.0. The detailed rationale for these findings, including references to the record developed in this proceeding, is contained in the Appendix to this document. The Commission considers these five findings to be a response to the mandate of the U.S. Court of Appeals for the District of Columbia Circuit and, in addition, a generic determination that there is reasonable assurance that radioactive waste can and will be safely stored and disposed of in a timely manner.

In its Notice of Proposed Rulemaking (44 Fed. Reg. 61372) the Commission stated that, if it found reasonable assurance that radioactive wastes will be offsite prior to the expiration of facility licenses, it would promulgate a rule providing that the environmental and safety implications of continued onsite storage after the termination of licenses need not be considered in individual licensing proceedings. The Commission further stated that if it determined that onsite storage after license expiration may be necessary or appropriate, it would issue

a proposed rule providing procedures for considering environmental effects of extended on-site storage in licensing proceedings. Such a rule is being issued in accordance with the Commission's findings presented here.

2.0 COMMISSION FINDINGS*

(1) The Commission finds reasonable assurance that safe disposal of high level radioactive waste and spent fuel in a mined geologic repository is technically feasible.

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*All findings by the Commission in this proceeding are limited to the storage and disposal of high-level radioactive waste and spent fuel generated by nuclear power reactors required to be licensed under Sections 103 or 104 b of the Atomic Energy Act of 1954 (42 USC §2133 and 2134(b)), and to facilities intended for such storage or disposal. The Commission's findings in this proceeding do not address the storage and disposal of high-level radioactive waste or spent fuel resulting from atomic energy defense activities, research and development activities of the Department of Energy, or both. This is consistent with the Nuclear Waste Policy Act of 1982, §8(c).

(2) The Commission finds reasonable assurance that one or more mined geologic repositories for commercial high-level radioactive waste and spent fuel will be available by the years 2007-09, and that sufficient repository capacity will be available within 30 years beyond expiration of any reactor operating license, to dispose of existing commercial high level radioactive waste and spent fuel originating in such reactor and generated up to that time.

(3) The Commission finds reasonable assurance that high-level radioactive waste and spent fuel will be managed in a safe manner until sufficient repository capacity is available to assure the safe disposal of all high-level radioactive waste and spent fuel.

(4) The Commission finds reasonable assurance that, if necessary, spent fuel can be stored safely and without significant environmental effects for at least 30 years beyond the expiration of reactor operating licenses at reactor spent fuel storage basins, or at either onsite or offsite independent spent fuel storage installations.

(5) The Commission finds reasonable assurance that safe independent onsite or offsite spent fuel storage will be made available if such storage capacity is needed.

3.0 FUTURE ACTIONS BY THE COMMISSION

The Commission's Waste Confidence decision is obviously in the nature of a prediction. While the Commission believes for the reasons set out below that it can, with reasonable assurance, reach favorable conclusions in confidence, the Commission recognizes that the possibility of significant unexpected events remains open.

Consequently, the Commission will review its conclusions on waste confidence should significant and pertinent unexpected events occur, or at least every 5 years until a repository for high-level radioactive waste and spent fuel is available.

4.0 REQUEST FOR COMMENTS BY PARTICIPANTS

While the Commission was preparing this Waste Confidence decision, the Nuclear Waste Policy Act of 1982 (Pub. L. 97-425) was enacted. The Commission believes that this Act has a significant bearing on the Commission's decision, and the Commission has considered it in reaching its conclusions here. In this regard, the Commission believes that the NWPA was of most significant impact in narrowing the uncertainties surrounding institutional issues. Regarding technical issues, the NWPA will not resolve these issues, but will establish the necessary programs, milestones, and funding mechanisms which should enable their resolution in the years ahead. However, the parties to this proceeding have not had an opportunity to comment on what, if any, implications the Act has for the Commission's decision. Further, the Commission's discussion of the safety of dry storage of spent nuclear fuel relies substantially on material not in the record. Therefore, this decision is being issued as a draft decision. The Commission requests the consolidated groupings of participants to comment on either or both of these issues. Comments should be no more than 30 pages long and should be limited to the implications of the Nuclear Waste Policy Act of 1982 for the Commission's Waste Confidence decision, and to the Commission's discussion of the safety of dry storage of spent nuclear fuel. Participants' comments should be filed with the Commission's Secretary not later than 45 days after publication of this document.

5.0 ADDRESSES: Send comments to: Secretary, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. ATTN: Docketing and Service Branch.

Hand deliver comments to: Room 1121 1717 H St., N.W., Washington, D.C. between 8:15 a.m. and 5:00 p.m.

Examine comments received at: The NRC Public Document Room, 1717 H St., N.W., Washington, D.C.

6.0 FOR FURTHER INFORMATION CONTACT: Dennis Rathbun or Clyde Jupiter, Office of Policy Evaluation, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, telephone (202) 634-3295.

7.0 OTHER VIEWS OF COMMISSIONERS

Additional views of Chairman Palladino, together with those of Commissioners Asselstine, Gilinsky and Ahearne are attached.

It is so ORDERED.

For the Commission

Samuel J. Chilk
Secretary of the Commission

Dated at Washington, D.C.
this 16th day of May, 1983

CHAIRMAN PALLADINO'S SEPARATE STATEMENT

Commissioner Ahearne's statement could be misunderstood to the extent it suggests that, but for the Nuclear Waste Policy Act (NWPA), the Commission would not have found confidence.

In my opinion, the enactment of that statute was not decisive for the Commission's findings of confidence regarding safe storage and disposal. Rather, it was important only for the Commission's finding on the timing of the availability of the waste disposal repository.

Prior to enactment of the NWPA, DOE presented to us the description of a program that had, as an objective, an operating repository before the time prescribed by the Court in the State of Minnesota v. NRC case (i.e., 2007-09). However, it was not clear from our deliberations that a Commission majority was convinced, on the basis of the DOE program alone, that there was reasonable assurance of the timely availability of a repository. As is explained in the Commission's Waste Confidence decision, the NWPA contains a number of features which strengthen the attainment of the objective. It was in this sense, I believe, that the Act contributed to the Commission's Waste Confidence decision.

ADDITIONAL VIEWS OF COMMISSIONER ASSELSTINE

Commissioner Asselstine notes that the Commission's fourth finding, as it applies to dry storage of spent fuel, relies heavily on material that is not contained in the record of this proceeding and on technical judgments that are not documented in either record material or extra-record material. Commissioner Asselstine therefore particularly invites comments on the judgments and extra-record material related to dry storage that are discussed in section 2.4.c of the decision document and on whether there exists an adequate technical basis for the Commission's fourth finding as it applies to dry storage.

1/12/83

SEPARATE VIEWS OF COMMISSIONER GILINSKY --

WASTE CONFIDENCE PROCEEDING

The Court of Appeals asked this Commission two questions: whether there is reasonable assurance that an off-site storage solution will be available by the years 2007-09, and if not, whether there is reasonable assurance that the fuel can be stored safely at the sites beyond those dates.[1] While I hope that off-site storage will be available prior to the expiration of the reactor licenses, the uncertainties surrounding this subject are so great that, notwithstanding the recent enactment of waste legislation, one cannot count on such storage facilities being available by the years 2007-09. In response to the second question, it seems to me that there is reasonable assurance that the spent fuel can be safely stored at the reactor sites for an extended period beyond the end of reactor operations.

Having made that finding, I feel compelled to add that although keeping the fuel at the reactor site is an acceptable solution in terms of public health and safety, it does not appear to be the best method of dealing with spent fuel.

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[1] State of Minn. v. U.S. Nuclear Regulatory Commission, 602 F. 2d 412, 418 (D.C. Cir. 1979).

The utilities are in the power business, not the waste storage business, and we cannot depend on all of them to continue to take an assiduous interest in their spent fuel when their sites are no longer producing power. Leaving spent fuel in the reactor storage pool after final shutdown may also complicate the clean-up and decontamination of the site. I would say that even while the reactor is still in operation it would be better to remove the spent fuel from the site. The station staff should not be distracted from its principal responsibility -- the safe and reliable operation of the reactor -- by the burden of overseeing radioactive wastes, a task which could be better performed by others.

Altogether, from the point of view of health and safety, it would be preferable for the spent fuel to be collected from the reactor sites, probably in dry storage casks, and stored at a central facility, where it would get better supervision and where it would not interfere with reactor operation. The waste legislation does make some provision for spent fuel storage away from reactors -- but only for about 3 percent of the expected inventory in the year 2000. This is a kind of "last resort" storage. Central storage for the bulk of the spent fuel would provide a greater margin of safety.

Additional Views of Commissioner Ahearne

Introduction

I am abstaining in today's Commission decision insofar it is a final one regarding the waste confidence proceeding. The Commission's actual final decision on the waste confidence proceeding will come after my NRC term ends. I do agree with putting this order out for comment and the following explains my views with regard to what the waste confidence proceeding found and did not find.

Commenters should know that the major factor in the Commission's finding is the Nuclear Waste Policy Act (NWPA). The Commission statement is that "the Commission believes that this Act has a significant bearing on the Commission's decision, and the Commission has considered it in reaching its conclusions here." The NWPA was fundamental to reaching the Commission's position. I believe that in the absence of the passage of this Act, the Commission could not have found confidence. Therefore I believe the principal question which commenters should address is whether the passage of the Act has the significance the Commission gives it in today's order.

The Commission could have chosen to rely on the NWPA as support for the general proposition that obstacles will be overcome and eventually action will be taken when necessary. However, the Commission order represents the view that the Act provides clear, detailed guidance and consequently there should be confidence that nuclear waste can be safely disposed of. In assessing this position and the implications for the Commission's finding of

confidence, I believe commenters should address the process which produced the NWPA, as well as the results.

Although there was general support in Congress for the proposition that something should be done to address the waste problem, there were differences on how to proceed. A delicate balance was struck in passing the Act. Competing philosophies led to considerable compromise. Much of this compromise took place in the closing days of the Congressional session, necessarily involving some confusion. The results are not always clear, and the long term support of Congress, particularly for specific aspects of the Act, is uncertain for the following reasons:

-- We have already encountered areas of ambiguity in the NWPA, e.g., Section 302 concerning NRC licensing authority and DOE contracts for disposal.

-- Dates specified in the NWPA may be useful in that they provide significant pressure and may be good general indicators. However, historically Congressional deadlines (be it for NRC reports, EPA standards, or other action) have often been missed.

-- It is inevitable that individual members of Congress are going to discover that they did not accomplish what they intended. For example, at least one member believed the Hanford site had been grandfathered from various requirements. However, certain provisions of the Act apparently have impeded this intended result.

-- The Act specifically requires that Congress revisit major, controversial issues (e.g. any state objections, monitored retrievable storage, the second repository). Given the tremendous effort and controversy involved in passing the NWPA, there is substantial uncertainty about the outcome of Congressional action in future situations.

-- Finally, as we have seen in the context of mill tailings, Congress may shift its position at any time. As difficulties arise, those who are affected will inevitably consider seeking legislative relief. Depending on the combination of events and personalities involved at that time, major changes could occur.

I agree that if the provisions of the Act are followed and if the Congress is willing to rise to the national interest when it is time to override a state veto attempt, that the Nuclear Waste Policy Act does provide the institutional program which has been so sorely lacking in the past. However, this Act barely was passed, squeaking by in the last hours of a long drawn-out Congressional session. The rushed passage produced several ambiguities and some steps not proposed by the Act's sponsors. Consequently, the public should address whether the NRC should have this Act be determinative for a finding of confidence.

Background

In October 1979 the Federal Register Notice announcing the rulemaking on the storage and disposal of nuclear waste said:

> "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 offsite storage will be available, and to determine whether radioactive waste can be safely

> stored onsite past the expiration of existing facility licenses until offsite disposal or storage is available." (FR Vol 24, No. 208, p. 61373)

The Commission also said:

> "In the event the Commission determines that onsite storage after license expiration may be necessary or appropriate, it will issue a proposed rule providing how that question will be addressed." (FR Vol 24, No. 208, p. 61373)

Thus the Commission proposed: (1) to answer how confident are we that waste can be safely disposed of; (2) if we do have such confidence, when will either offsite storage or permanent disposal be available; and (3) if neither is available, can radioactive waste be safely stored onsite until such offsite facilities are available. In addition we said that if we did reach the conclusion that the waste would have to be stored onsite, we would propose a new rule.

The Commission must reach conclusions covering four time periods:

(1) The next 15-30 years, the period in which plants will be required to find some place to store spent fuel as facilities end their service life (under the current assumptions of the service life). The Commission must address whether there will be offsite facilities available in this timeframe or whether the fuel must be retained onsite and, if so, can it be done safely.

(2) The next 50-100 years, the time period over which an underground storage repository would receive waste and, under current proposals, be actively protected.

(3) The next 1,000 years, the period in the opinion of the NRC staff and EPA over which constraints must be provided, such as waste packaging and engineered barriers to prevent radioactivity from reaching access pathways to the biosphere.

(4) Many tens of thousands of years, the time period over which some of the long-lived radioactive materials are hazardous.

We are asked to make some estimate of confidence over this long stretch based upon examination of a thirty year old program that has had a high priority for only about six years, namely, the federal program to find the solution for safe disposal of nuclear waste. It is impossible to be definitive about thousands of years into the future, certainly not with any high degree of confidence. It is possible to make some statements about the next one thousand years, but at the moment only theoretically. It is more possible to make statements about 50-100 years and is quite possible to make them about 15-30 years. Consequently, I have reached the conclusion the Commission should focus upon what is most likely to happen over the next 15-30 years and then speak with some degree of precision with respect to what we expect to happen over the next 50-100 years. Implying certainty beyond that is really not justified.

Summary of Conclusions

I reach the following conclusions:

-- I have reasonable confidence that radioactive waste can be safely disposed of.

-- The record does not enable me to determine either when such disposal would be available or when offsite storage will be available, although I would estimate that permanent disposal will be available somewhere in the years 2000-2010 and that offsite storage can be available within 3-4 years of the date it is perceived that such is absolutely necessary.

-- The record supports the finding that radioactive waste can be stored onsite past the expiration of existing facility licenses for a period of 20-30 years.

-- The Commission should propose a rule providing how that will be addressed.

Technical Problems

A number of participants have addressed the question of the technical problems of permanent disposal. On December 10, 1980, the ACRS wrote to me:

> "In our review of disposal of radioactive waste in geological repositories we did not find any basic technical issues that, in our opinion, would require further attention prior to a rulemaking finding of confidence."[1]

The NRDC, which in general concludes we should have difficulty reaching a finding of confidence, has said that:

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

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[1]The ACRS also addressed the other two questions, commenting:

> "We believe that the DOE estimate for completion of a waste repository by 1997-2006 is technically achievable. . .[U]ntil the issue of consultation and concurrence among Federal, state and local authorities is better resolved and the licensing/litigation process as well as standard setting by EPA and NRC is better defined, we believe that trying to forecast a firm availability date for repository is futile in absence of action by Congress."

They also wrote:

> "We believe that safe interim storage well beyond thirty years can be provided should it be required."

I find that no serious question was raised regarding the technical feasibility of solving the waste disposal problem.

Unfortunately, the same statement could probably have been made at any point over the last twenty-five years as waste disposal has been addressed fitfully in this country and elsewhere. The problems have been the lack of a Federal resolve to address the problem and an inability to find a site to locate a disposal facility. (The latter problem seems to be worldwide, with few exceptions.) The Working Group established to assist NRC in its addressing the Waste Confidence Proceeding pointed out that:

> "To the extent that technology for safe waste disposal is not 'off the shelf' an NRC confidence finding would be largely an expression of confidence that the DOE ongoing waste research and development program will produce the anticipated results in the years ahead. Until the program is completed there necessarily remains a degree of uncertainty regarding whether DOE will find the answer to questions still open and whether those answers, when found, will turn out as hoped for." (footnote omitted)(p. 7, Report of the Working Group on the Proposed Rulemaking on the Storage and Disposal of Nuclear Waste, January 29, 1981.)

The Working Group further commented (p. 8):

> ". . .[S]ignificant progress has been made in developing the technology for safe storage and disposal of spent fuel [however] a great deal of work remains to be done. If waste is to be safely disposed of by around the end of the century, then a sufficient level of technical resources must be committed to the technology development and these resources must be effectively managed."

The Working Group identified areas in which additional information is needed for successful completion of the program:

> "Additional data and information on waste form, interaction between nuclear waste and the host medium, performance of engineered barriers and seals, and retrievability would be required to demonstrate the adequacy of the system elements on a site specific basis." (p. 38)

The Working Group also identified what in their view were critical issues:

> "One of the critical issues is whether repository sites having adequately favorable geological characteristics will be found to exist." (p. 45)

I believe there are three major issues. Failure to solve any one of them would preclude safe geological waste disposal and substantial delay in solving them would delay the operational date of a repository: (1) finding acceptable sites, (2) developing effective waste packages, and (3) developing engineered barriers.

Site Selection

I do not believe safe waste disposal will require fundamental scientific breakthroughs. Identifying a suitable geological setting is the crucial technical and political problem. The record of this proceeding indicates that a site has not yet been identified as acceptable. The data required to assure the adequacy of a candidate site will likely require extensive onsite investigations, including drilling or excavating. The USGS has noted that DOE has concentrated on a single rock-type, salt, or a single category of land use, Federally-owned nuclear reservations, but within this context has proceeded in a scientifically sound fashion. Even the opponents of the DOE program have indicated "Repository siting would be feasible in the sense that there is no law of science that makes it impossible" (New York State Attorney General Tr. of oral presentations, January 11, 1982, p. 98). DOE has admitted that there is more work needed: "We would not propose that there is an adequate scientific basis to proceed without any further R&D or without any further exploration" (DOE, Tr. January 11, 1982 pp. 236, 237). The DOE is conducting work at several sites. Whether they will turn out to be suitable remains open to the further site exploration required by the NRC rule. If these sites do not turn out to be adequate, I believe that other sites will then be examined. I do not share the belief that none of these

sites will be adequate. I remain open to proof one way or the other based upon the data.

Waste Package

The second concern is whether a waste package can be developed that will contain the waste for a suitably long time. The DOE has argued it can be, the NRC's rule requires it to be, and the USGS has stated: "The principle of a long-lived canister has merit, and is within the capability of material science technology to achieve, in the same timeframe as repository site identification, qualification and development." (USGS: PS p. 11) The National Research Council has reviewed work done in Sweden and has concluded the Swedish waste package would be effective in containing radionuclides in spent fuel for hundreds of thousands of years. (DOE CS p. II-95)

There is substantial work remaining to be done in the development of a program to successfully dispose of spent fuel. Spent fuel is more difficult to dispose of than reprocessed waste because, as has been pointed out by the Working Group, "spent fuel is chemically heterogeneous and, as a result, its complex chemical characteristics must be taken into account when assessing the suitability of a particular candidate host rock for disposal. . . .DOE has committed to a[n] engineering plan which will result in the development of additional information in the years ahead" (Working Group report, op cit 54). With regard to the shift in the DOE's planning from disposal of spent fuel to disposal of reprocessed waste: reprocessed waste is a simpler form than spent fuel, with lower heat loading, and consequently would be easier to dispose of. Nevertheless, the DOE program apparently is designed to accommodate either. This is wise, since whether or not there is

reprocessing, there will most likely still be spent fuel to dispose of. The economics of reprocessing may not lead to reprocessing all previously used fuel.

Engineered Barriers

The final question of engineered barriers is similar to that of the waste package. Work on effective bore hole and shaft sealing is still in progress. I conclude that substantial work in these areas remains but have reasonable confidence that the program to resolve these will be developed and that the technical issues involved are not insurmountable.

DOE Program

The DOE program has a number of steps. The Waste Confidence Proceeding developed a description of the DOE program as of 1980. Most critical path milestones are in the future and some proposed early milestones have been changed or deleted as the DOE waste program itself has changed over the last three years. Nevertheless, the record indicates a program to find sites, develop sites, develop a spent fuel develop waste packages and engineered barriers, and to go through testing prior to choice of any particular solution. The continuity of the program is difficult to assess. The first critical milestone is not until mid-1983, to commence shaft work at three sites. The first license application is estimated for the late 1980's and, if all is successful, the construction authorization for the first repository is programmed to be granted in the early 1990's.

Conclusions

I do find the record of the waste confidence proceeding has raised a number of unresolved issues regarding management, state and Federal interactions, national commitment, and continuity of Federal waste management policy, as well as some technical issues with regard to disposal technology and siting. These do not alter my fundamental conclusion of technical feasibility. I believe that institutional and technical uncertainties make the date at which disposal will be available uncertain enough that some margin beyond the range stated by DOE is desirable as a necessary part of finding a reasonable assurance that disposal will be available. The enactment of Congressional legislation which resolves many of the institutional issues obviously has made the date of repository availability a little more certain and has enabled the Commission to find confidence that the DOE's program will result in initial operation of a repository around the year 2000.

There is little question that spent fuel storage capacity could be available eventually if needed. However, the record indicates the commitment to make the capacity available is equivocal. The record of the proceeding indicates general willingness on the part of industry to do whatever is necessary to deal with the near term problem of the filling of the reactor spent fuel storage pools, to avoid shutting down or derating of reactors. However, the industry's response to the change in the DOE AFR storage problem does not amount to a firm commitment to provide AFR storage until permanent disposal is available. DOE estimates that AFR spent fuel storage facilities can be available as early as 3-4 years after Congressional authorization. An inability to meet a 1990's repository availability date would be apparent

several years before that and, in DOE's opinion, necessary plans could be made to accommodate any added AFR storage requirements. I agree. Nevertheless, it appears that industry and DOE are waiting for each other to make a commitment to implement AFR storage of spent fuel. The record contains statements that if industry must do it, it will, and, clearly, if DOE is required by legislation to provide AFR capacity, it will. I have confidence that radioactive waste can continue to be stored safely in existing onsite storage facilities for a period of 20-30 years beyond the expiration of facility licenses without significant environmental impact. I also believe that it is possible that this will be necessary.

My conclusion is on a generic safety and environmental basis, which I believe should be adequate for the present and needs no separate generic environmental impact statement or individual plant environmental impact assessments or statements at this time. However, I do not believe the record is sufficient for detailed site specific findings and therefore believe the Commission must require licensees to submit site specific information on licensee plans for storage or disposal of radioactive waste a period of 5-10 years prior to the expiration of a facility license. Based on that information the NRC would then prepare individual safety evaluation reports and either environmental assessments or environmental statements for site specific licenses. I believe the Commission should issue a rule prescribing how the extended onsite storage fuel should be treated in reactor licensing and spent fuel pool expansion cases. I believe the Commission can conclude that evidence in the record is sufficient to demonstrate that storage of spent fuel at reactor pools is safe and will be environmentally acceptable for several decades after expiration of reactor operating licenses. This period

after license expiration is adequate for interim storage until final disposal is available, taking into account the uncertainties in the date of repository operation.

The NRC should revisit the waste confidence decision every five years to monitor the progress that the DOE is making in solving the technical and political issues, in particular, waste packaging, engineered barriers, and site location.

APPENDIX

RATIONALE FOR COMMISSION FINDINGS
IN THE MATTER OF THE
WASTE CONFIDENCE PROCEEDING

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1.0 INTRODUCTION

The rationale for the five Commission findings resulting from the Waste Confidence proceeding is summarized below. This rationale is based principally on the record of the proceeding which includes participants' position statements, cross-statements, pre-hearing and oral statements (in the discussion below, the participants are identified by the citations defined in the Reference Notation at the end of this document). The Commission also relied on the provisions of the Nuclear Waste Policy Act of 1982, which is not a part of the record. Other substantive extra-record material is included in the discussion of the safety of dry storage of spent nuclear fuel in the Commission's Fourth Finding.

2.0 RATIONALE FOR COMMISSION FINDINGS

2.1 First Commission Finding

<u>The Commission finds reasonable assurance that safe disposal of radioactive waste and spent fuel in a mined geologic repository is technically feasible.</u>

The Commission finds that safe disposal of high-level radioactive waste and spent fuel is technically possible and that it is achievable using existing technology. Although a repository has not yet been constructed and its safety and environmental acceptability demonstrated, no fundamental breakthrough in science or technology is needed to implement a successful waste disposal program. Those participants who questioned the availability of a repository did not contend that fundamental scientific breakthroughs were required, but questioned whether technical problems could be resolved in a timely manner. The record supports the conclusion that the safe disposal of high level radioactive waste and spent nuclear fuel from licensed facilities can be accomplished.

The Department of Energy's (DOE) position is that disposal in mined geologic repositories can meet the goal of providing safe and effective isolation of radionuclides from the environment (DOE PHS pp. 2, 4; Tr. p. 11). A number of participants stated that waste containment and isolation from the biosphere are scientifically feasible (USGS PS p. 4; NRDC PS p. 9; UNWMG-EEI PS, Doc. 1 p. 22, Doc. II p. II-6; Consolidated Industry Group Tr. p. 16; Consolidated States Group Tr. p. 98). This view is consistent with the conclusions of the Report to the American Physical Society by the Study Group on Nuclear Fuel Cycles and Waste Management (Rev. Mod. Phys., Vol. 50, No. 1, Pt. II, p. S6, Jan. 1980) and the Report to the President of the Interagency Review Group on Nuclear Waste Management (Final Report, March, 1979, p. 38).

The conclusion that safe radioactive waste disposal is technically feasible is based on consideration of the basic features of repository design and the problems to be solved in developing the final design. A mined geologic repository for disposal of high-level radioactive waste, as developed during the past three decades, will be based on application of the multi-barrier approach for isolation of radionuclides. The high-level radioactive waste or spent fuel is to be contained in a sealed package and any leakage from the package is to be retarded from migrating to the biosphere by engineered barriers. These engineered barriers include backfilling and sealing of the drifts and shafts of the mined repository. We believe that the isolation capability and long-term stability of the geologic setting provide a final barrier to migration to the biosphere.

The selection of a suitable geologic setting is one of the key technical problems which DOE must solve. The solution of other key problems depends on human ingenuity and know-how. These include the development of waste packages that can contain the waste until the fission product hazard is greatly reduced and engineered barriers that can effectively retard migration

of radionuclides out of the repository. The Commission recognizes that these three problems are not the only ones which DOE's program must solve, but they are critical components of the multi-barrier approach for nuclear waste isolation. Much of the discussion in this proceeding has focused on these problems. We have reviewed each of these issues and have concluded that they do not present an insoluble problem which will prevent safe disposal of radioactive waste and spent fuel.

A. The Identification of Acceptable Sites

There is general agreement among the participants that the period during which the wastes must be isolated from the biosphere is at least several millenia and that such prolonged isolation can be achieved in a deep mined repository provided the geologic setting is suitable. The geologic setting is the "final" isolating barrier. If the waste package and engineered barriers fail to perform as expected, the geologic barrier must prevent harmful quantities of radioactive materials from entering the human environment.

The Commission believes that technically acceptable sites exist and can be identified. In many locations in the continental United States there are geologic media potentially suitable for a waste repository. These media occur in large, relatively homogeneous and unfaulted formations and have properties (e.g., mechanical strength, thermal stability, impermeability to water) which qualify them as potential host rocks for radioactive wastes. The potential host rocks include those being investigated by DOE--that is, domed salt, bedded salt, tuff, basalt, granite, and shale (DOE PS pp. II-70 to II-80.). Thousands of square miles of the United States are underlain with formations containing extensive masses of such potential host rocks. Moreover, more than one-half of the United States is underlain with rock that has been stable against deformation and disruption for over ten million

years. The potential sites being investigated by DOE are in regions of relative tectonic stability (USGS PS pp. 19, 23, 24, 25,26, 28; Tr. p. 236).

Host rock suitability and formation stability are not the only relevant technical factors to be considered in repository site selection. Geohydrologic conditions--particularly the absence of significant groundwater flow from the repository to the biosphere--must be favorable for effective isolation of the wastes (USGS PS p. 11). DOE's investigations reveal that the hydrologic characteristics of a major portion of the sites underlain with stable formations of potential host rock appear to be suitable for repository location (Tr. p. 236; DOE PS p. II-77).

These general conclusions about the extent of potential repository sites are based on the results of DOE's site exploration program (DOE PS Appendix B) and the extensive body of earth-sciences information available at the United States Geological Survey--the Federal agency principally concerned with earth-sciences issues and, under a DOE-USGS Memorandum of Understanding, a primary source of geologic, hydrologic and mineral resource data for the National Waste Terminal Storage program (USGS PS p. 2 and Appendix A; DOE PS p. III-44).

DOE's site exploration efforts are focused on four host rocks (domed salt, bedded salt, basalt, and tuff) in six regions (Gulf Interior, Paradox Basin, Permian basin, Salina Basin, DOE Hanford Site, DOE Nevada Test Site). (DOE PS Appendix B). Although investigations of granite sites in the U.S. have been limited, DOE is developing data on the potential of granite as a host rock in collaboration with foreign investigators. A Swedish-American cooperative program (DOE's Lawrence Berkeley Laboratory is the U.S. principal in the program) involves a series of in situ tests in a granite formation being conducted at the Stripa mine in Sweden. The investigations include determinations of thermally induced stresses and deformations in the granite

rock mass. Another cooperative study at Studsvik in Sweden involves experiments in nuclide migration in fractured subsurface crystalline rocks (DOE PS p. II-258).

Some participants objected to the fact that most of DOE's site exploration involved federally-owned or -controlled areas, arguing that this would result in ignoring sites that were technically better (NRDC PS p. 17; Tr. p. 206). This objection, apparently based on the assumption that Federal lands investigated were limited in area and geologic diversity, is not supported by the record. The Federal lands being investigated by DOE are extensive and geologically diverse; moreover, they are more readily accessible to DOE and some of them, such as the Nevada Test Site, have been previously subjected to extensive geologic assessment. These latter factors are significant advantages (DOE PS Appendix B; UNWMG-EEI CS p. IV. B-4). Although, as the United States Geological Survey pointed out, there may be advantages from a purely earth-science viewpoint in examining all parts of the country for their potential as repositories, time and resource limitations require that site exploration efforts be concentrated in limited regions fairly early so that detailed site-specific characterization efforts can be undertaken in a timely way (USGS PS p. 17).

A specific site has not yet been identified as technically acceptable, and investigations of potential sites have shown some to be unsuitable. This does not necessarily mean that DOE's site selection program will be unsuccessful in identifying technically acceptable sites. The elimination of some sites is to be expected in a pursuit of the site selection program and is not, as some participants implied, an indication that suitable sites cannot ultimately be found.

Although the record of this proceeding does not show that DOE has progressed far enough in site characterization to confirm the existence of an acceptable

site, the record does indicate that DOE's site characterization and selection program is technically sound. The data obtained in each stage of the screening process are analyzed and compared against criteria that must be satisfied for adequate performance of the total isolation system. DOE's program is providing information on site characteristics at a sufficiently large number and variety of sites and geologic media to support the expectation that one or more technically acceptable sites will be identified (DOE PS pp. III-8 to III-24; CS p. II-140). As discussed above, DOE's site screening efforts have concentrated on a diverse set of potentially suitable geologic media and are directed to an examination of large areas of the country on both federally-owned and non-federal lands (USGS PS p. 17).

The technology for site identification is particularly well-advanced (UNWMG-EEI PS p. III-A-b79). The record describes numerous site characterization techniques, both remote sensing and in-situ, which are being used to evaluate sites (DOE PS pp. II-84 to II-103). The location and demonstration of acceptability of repository sites are problems which can be solved by the investigative and analytical methods now available (AEG PS p. 1). Site selection criteria are being refined (DOE PS pp. II-80 to II-83; 48 Fed. Reg. 5671, February 7, 1983) and the technology exists for site characterization (DOE PS pp. II-84 to II-103). Areas have been found where most natural geologic and hydrologic processes operate at rates favorable to long-term containment in a mined repository (DOE PS p. II-128; Consolidated Industry Group PHS p. 9).

The Commission recognizes that there are gaps in the current state of knowledge about potential repository sites and geologic media, and about geochemical processes which affect radionuclide migration (e.g., CEC PS pp. 17, 54; NRDC PS pp. 18, 50, 64; NY pp. 38, 80; USGS CS pp. 5, 6). The gaps include a lack of a detailed understanding of such relevant processes as sorption of radionuclide-bearing molecules by the geologic media, leaching of

the wastes by groundwater, and radionuclide migration through subsurface formations. Some participants contend that these gaps and uncertainties in knowledge make it difficult to predict on the basis of any effort less than a detailed on-site investigation whether a candidate repository site will be technically suitable (e.g., NRDC PS pp. 18, 50, 53; ECNP PS pp. 3, 4; NECNP PS pp. 20, 21, 22).

The Commission recognizes that detailed site characterization is necessary to confirm that a proposed site is indeed suitable. The Commission does not believe, however, that all uncertainties must be resolved as a pre-condition to repository development. The performance of a repository may be bounded by using conservative values for controlling parameters, such as waste form solubility, ground water travel time and retardation of radionuclides. Furthermore, bounding analyses can be useful to take residual gaps in knowledge and uncertainties into account. If it can be established that a repository can perform its isolation function using established, conservative values for the controlling parameters, then it is not necessary to resolve uncertainties in the range of values these parameters may exhibit (DOE CS pp. II-83, II-84, II-130, III-9, III-12).

The statements of those participants who are pessimistic about timely accomplishment of disposal tend to assign equal importance to all areas of uncertainty. Hence, they contain few attempts to assess the consequences of gaps in knowledge or to project the benefits of expected results from ongoing research and development efforts. It is the Commission's belief that the waste isolation system elements are adequately understood so that major unforeseen surprises in results of research and development are highly unlikely. This view is supported by USGS (USGS CS pp. 1-2).

A further concern of some participants is that, even if DOE were to identify a potentially acceptable repository site, the in-situ testing required to

determine acceptability would breach the integrity of the candidate site (NY PS pp. 59, 63-65). If, for example, boreholes essential to characterize a potential site result in penetration of aquifers which are not amenable to effective sealing, this might make the site unacceptable (DOE PS pp. II-161 to II-164). However, no persuasive evidence was presented in the record to support the position that in-situ tests for site characterization work are likely to compromise the integrity of candidate sites. The Commission believes that in-situ tests can be successfully accomplished without adversely affecting site integrity for the following reasons. Many non-destructive remote sensing methods are available for determining site characteristics. Further, boreholes can be located in shafts or pillars of the future repository to minimize the possibility of leakage through them. As discussed later, borehole sealing methods are expected to be adequate. The number of boreholes necessary to adequately characterize a site can be minimized by careful planning and by use of remote sensing methods in conjunction with the drilling program (DOE PS pp. II-84 to II-103, II-181). Finally, the Commission considers that if a site is found to be sufficiently sensitive to the testing program so that its integrity would be destroyed, then that site would necessarily be found unacceptable.

In summary, the Commission believes that technically acceptable sites for disposal of radioactive waste and spent fuel exist and can be found. There are a number of suitable host rock types to select from; many areas are underlain with massive, stable formations containing these host rocks; the areas being investigated by DOE contain such rock formations; and the uncertainties in knowledge of the earth and material sciences relevant to the identification of an acceptable repository site are not fundamental uncertainties that would prevent the identification of technically acceptable sites. Further, in-situ testing required to characterize a candidate site would not necessarily compromise its integrity.

B. The Development of Effective Waste Packages

1. Waste Package Considerations.

An important technical aspect of safe waste disposal is to assure that the waste form and the balance of the waste package, including the primary container and ancillary enclosures, are capable of containing the radioactivity for a time sufficient for the hazard from fission-product activity to be significantly reduced (e.g., DOE PS p. II-8). Decay heat, groundwater and nuclear radiation could cause the waste package components to interact with each other or with the host rock materials in such a way as to degrade the ability of the package to contain the radionuclides. These items are discussed below.

To assure long-term containment, DOE's conceptual design of a waste package is based on a defense-in-depth approach and involves a number of components including spent fuel, stabilizer (or filler), waste canister, overpack, and an emplacement hole sleeve. The stabilizer is intended to improve heat transfer from the spent fuel, to provide mechanical resistance to possible canister collapse caused by lithostatic pressure, and to act as a corrosion-resistant barrier between the spent fuel and the canister. Selection of canister overpack and emplacement hole sleeve materials will be based on tests of their chemical and physical integrity at various temperatures and levels of radiation and under various conditions of groundwater chemistry, as well as tests of their compatibility with each other and with the host rock materials under repository conditions. The canister, overpack, and sleeve should constitute relatively impermeable elements of the waste package. A variety of candidate materials is being considered for these elements. The various waste package components are to be combined in a conservative design that will compensate for the overall technical uncertainties in containment capability. The requirement for

retrievability during some specified period after emplacement places conditions (e.g., ruggedness) on waste package design which are added factors to be considered in its development (DOE PS p. II-129 to II-152, II-282).

It is apparent from the foregoing that the development of an effective waste package depends on obtaining engineering data on those materials that appear to be promising candidates for package components. DOE is studying over 28 candidate materials for canisters and overpack (DOE PS p. II-143). The DOE evaluation program indicates that many of these materials are promising. For example, iron alloys have demonstrated long term durability (DOE PS p. II-144, Reference 383), and titanium alloys and nickel alloys show high resistance to corrosion (DOE PS p. II-144, Refs. 315, 338, 342). Ceramics are resistant to chemical degradation and have many other desirable properties (DOE PS p. II-145, Refs. 337, 347, 348 and 349). Preliminary analysis indicates that mild steel canisters with an appropriate backfill material would be a feasible waste package for either a salt or hard rock repository. For more demanding requirements, such as brine applications, the alloys of titanium, zirconium or nickel appear to represent alternate choices (DOE PS p. II-150, Refs. 337, 382). The DOE program also includes experimental studies of the release of radioisotopes from spent fuel exposed to simulated repository conditions (e.g., salt brine and fresh water with varying dissolved oxygen content). The studies are being conducted under temperature and pressure conditions that bound and exceed repository conditions (DOE PS pp. II-139 to II-141).

Not all participants were optimistic about waste package development. One participant asserted that in spite of DOE's efforts to develop a package that would remain inert and stable under repository conditions, none had yet been found and the DOE program would not succeed in finding one (NRDC PS p. 46.) Other participants pointed to the limits of present knowledge, particularly about the leaching of radioisotopes from spent fuel in a groundwater

environment, and concluded that it is not possible to select a waste form which will prevent radioisotopes from migrating to the biosphere (e.g., CEC PS p. 51). They also pointed out that chemical and physical properties of spent fuel varied widely and depended on burnup, location within the reactor core, age, and physical integrity; design of a system of barriers to accommodate this heterogeneity within the context of a given geohydrologic environment would be a major undertaking (NY PS p. 83).

The Commission recognizes the difficulties which must be overcome in developing a suitable waste package. A large body of experimental data must be accumulated and applied to a variety of candidate arrangements of waste package components. Suitably conservative assumptions must be postulated to define the repository conditions. Data from experiments of relatively short duration have to be used to predict behavior for much longer periods. It is common practice in materials research to perform short-duration experiments under physical or chemical conditions much more severe than those expected for the longer duration and, from known fundamental properties of the materials under investigation, to extrapolate the experimental data to predict long-term behavior. Conservatism can usually be assured by making the experimental conditions sufficiently severe.

The complex composition of the mixture of radionuclides in fission products and their basic chemical properties are known and have been the subject of investigation for more than three decades. The large body of published data on fission product chemistry and experience with fission product mixtures should provide considerable support for predicting the behavior of spent fuel

and high-level radioactive waste in waste package designs.* The Commission, therefore, concludes that the chemical and physical properties of spent nuclear fuel and high-level radioactive waste can be sufficiently understood to permit the design of a suitable waste package.

The Commission also concludes that the DOE program is capable of developing a suitable waste package which can be disposed of in a mined geologic repository. This conclusion is based upon the large number of candidate materials being considered by DOE, the detailed evaluation of these materials to be conducted as part of the DOE program and the results of DOE's preliminary analysis of candidate materials, as described above (see Sec. 2.1(b)(1)). The Commission's conclusion that the development of a suitable waste package is technically feasible is also consistent with other material in the record. For example, a study sponsored by the National Academy of Sciences (NAS) concluded that no insurmountable technical obstacles were foreseen to preclude safe disposal of nuclear wastes in geologic formations (UNWMG-EEI PS Doc. 2 p. II-6). The United States Geological Survey stated that a long-lived canister is within the capability of materials science technology to be achieved in the same time frame as repository site identification, qualification and development (USGS PS p. 11). The National Research Council, after reviewing the Swedish waste disposal work (DOE PS p.

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*Published compilations of such data, although not in the record of this proceeding, are well known to the nuclear science and engineering community. Examples are the three volumes of the National Nuclear Energy Series, "Radiological Studies: The Fission Products," by C. D. Coryell and N. Sugarman, McGraw-Hill, 1951; "Reactor Handbook," Second Edition, Vol. II, Fuel Reprocessing, edited by S.M. Stoller and R.B. Richards, Interscience Publishers, Inc., New York, 1961).

II-335 Ref. 380), concluded that the Swedish waste package could contain the radionuclides in spent fuel rods for hundreds of thousands of years (DOE CS p. II-98).

2. Effect of Reprocessing on Waste Form and Waste Package.

The waste form itself (spent fuel or other high-level waste) serves as the first barrier to radionuclide release and thus supplements the containment capability of the other components of the waste package as well as the repository's natural isolation capability. Throughout this proceeding it has been assumed that the waste form would be spent fuel discharged from light water reactors, with mechanical disassembly for volume reduction and packaging in a canister as the only potential modifications. The relevant properties of the spent fuel (irradiated uranium dioxide pellets and zircaloy cladding) are known. DOE's program has been directed toward providing data to determine the behavior of spent fuel as a waste package component under repository conditions. In its Position Statement DOE stated that the "representative case" to be considered in this proceeding is the disposal and storage of spent fuel from commercial reactors and that this does not foreclose "other approaches, such as the reprocessing of spent fuel and solidification of resultant nuclear wastes" (DOE PS p. I-2).

On August 27, 1981 the Natural Resources Defense Council filed a Motion for Judgment requesting a prompt ruling that, on the basis of the present record, there is not reasonable assurance that off-site storage or disposal will be available by the year 2007-09. NRDC stated that, because the present

Administration* had changed Federal policy towards commercial reprocessing of spent fuel (reprocessing was deferred "indefinitely" in April 1977 by the previous Administration), the disposal of spent fuel would be contrary to the present Administration's policy, and thus spent fuel was no longer a valid "reference waste form" for this proceeding. As a consequence, according to NRDC, DOE schedules and timetables, which were based on spent fuel storage and disposal, were irrelevant. The NRDC view was challenged by DOE as well as by seven participants representing utilities and the nuclear industry. The Commission took note of the NRDC filings and the responsive filings by other participants, considering them part of the record, and in its November 6, 1981 Second Prehearing Memorandum and Order asked the participants to address the significance of commercial reprocessing to the Commission's decision in the waste confidence proceeding. In response, the participants addressed this change in government policy in their prehearing statements filed in December 1981.

In response to those who argued that the change of reprocessing policy invalidated DOE's position, DOE stated that the program for development of the technology is not dependent on the waste form. Moreover, DOE pointed out that the purpose of this proceeding--"to determine whether there is at least one safe method of disposal or storage for high-level radioactive waste" is not changed by this Administration's support of reprocessing of spent fuel (DOE PHS pp. 2-3). Some participants who agreed with DOE commented that spent fuel disposal involves greater difficulty than disposal of solidified

*The NRDC statement was based on DOE testimony before a Congressional committee. The President's Nuclear Policy Statement of October 8, 1981 confirmed the DOE testimony.

reprocessing waste because of its higher radioactivity and less easily handled form; in addition, they asserted that the removal of the uranium and most actinides by reprocessing would ease the requirements for safe long-term storage and simplify the waste disposal problem (UNWMG-EEI PHS p. 16; SE2 PHS p. 4). Others contended that spent fuel is a more difficult waste form because heat dissipation and packaging problems involved in disposal appear to be more severe than in disposal of solidified reprocessing waste (AIF PHS p. 6; ANS PHS p. 5).

The Commission recognizes that the proceeding has been primarily concerned with storage and disposal of spent fuel. However, the Commission does not believe that the possibility of future reprocessing, and the potential need to dispose of high-level radioactive waste resulting from reprocessing, significantly alters the technical feasibility of the schedule for developing a mined geologic repository and the design of its multiple barriers.

With regard to technical feasibility, the effect of spent fuel reprocessing on the commercial radioactive waste disposal problem is not a new consideration. The disposal of waste from reprocessing spent fuel has been studied for a longer time than the disposal of spent fuel. Until 1977, the commercial waste management program was directed primarily toward disposal of waste from spent fuel reprocessing, and those efforts have continued. A variety of waste forms has been studied (DOE PS pp. II-153 to II-160). Thus, considerable information is already available on the technical feasibility of developing a suitable waste form for reprocessed high-level radioactive waste. In fact, there is evidence that the disposal of reprocessed high-level waste may pose fewer technical challenges than the disposal of spent fuel (Tr. p. 29). Moreover, commercial reprocessing of spent fuel cannot be undertaken in this country in the absence of a full NRC licensing review. That review will consider, among other things, the waste form to be produced by the reprocessing method and its implications for waste disposal.

Unless the Commission determines that commercial reprocessing and management of its products assure adequate protection to the public health and safety and the common defense and security, spent fuel will continue to be the predominant commercial waste form available for disposal in a repository.

With regard to the impact on DOE's repository schedule, the Commission recognizes that DOE's waste package development program will eventually be affected to some extent by the nature of the waste form under development. However, the direction taken in research and evaluation of materials being conducted in the DOE program is expected to produce results which would be relevant to the waste package design, regardless of which waste form is used (DOE PS pp. II-141 to II-152, CS pp. II-96 to II-100). Moreover, the choice of waste form will not significantly affect other elements of the DOE repository program. The storage and disposal of reprocessed waste would involve substantially the same problems as those being addressed for spent fuel, and a change in waste form would not alter the site-selection program nor the program for development of suitable engineered barriers (DOE PHS p. 3). Thus, DOE's program is proceeding on a basis that would permit the disposal of either high-level waste or spent fuel. This approach is consistent with the recommendations of the Interagency Review Group in its March 1979 report to the President (IRG Final Report, p. 73) and with the direction in the Nuclear Waste Policy Act of 1982 (Sec. 111(a)(2)). Finally, as noted above, any decision to permit the commercial reprocessing of spent fuel will include consideration of the reprocessed waste form and its implications for waste disposal. For these reasons, the Commission concludes that the possibility of commercial reprocessing does not substantially alter the technical feasibility of, or the schedule for, developing a suitable waste package.

The Commission concludes that the basic knowledge of spent fuel and high-level waste and its behavior in a repository environment, together with

DOE's ongoing development and testing program, are sufficient to provide assurance that a waste package can be developed that will provide adequate containment until the potential hazard from the fission product activity is sufficiently reduced.

C. The Development of Effective Engineered Barriers for Isolating Wastes From the Biosphere

1. Backfill Materials

In DOE's conceptual design, one engineered barrier consists of backfill materials for filling voids between canister, overpack, sleeve and host rock. The materials are chosen to retard radionuclide migration. The task is to design and test barrier materials which will be effective for very long periods of time. Candidate materials include bentonite, zeolites, iron, calcium or magnesium oxide, tachyhydrite, anhydrite, apatite, peat, gypsum, alumina, carbon, calcium chloride, crushed host rock, and others (DOE PS p. II-147). Host rock or other materials would also be used to backfill drifts and shafts within the repository.

The California Department of Conservation (CDC) contends that repository shaft and borehole backfill material performance may be degraded as a result of increased temperature and other factors (CDC PS pp. 19-22). However, the expected temperature rise in the shaft backfill material will be only about 10 Farenheit degrees, and will cause no significant degradation of the shaft backfill material (DOE, PS p. II-347 Ref. 527 NUREG/CR 0495). Other participants believe that there is inadequate information to permit development of long-lived engineered barriers that will effectively contain high-level radioactive wastes (NRDC PS pp. 18, 32; I11 PS pp. 3-4; NECNP PS p. 18). CDC further contends that at this time, no information appears to have been developed that specifies the best type of backfill material to be

used in particular geologic media (CDC PS pp. 19-22). However, the choice of backfill must take into account the rock media at the selected site as well as the waste package material. Thus, the backfill cannot be selected until a repository site has been selected. The NWTS program has as its objective, providing information on a practical range of options for backfill materials. Although a considerable amount of work remains to be done, an active research and development program on backfill materials is underway (DOE PS p. II-147). Further, that program is providing information to evaluate the backfill material options, as well as to establish a basis for selection of a suitable material for the geologic media being considered. The Commission believes that this approach provides an adequate basis for concluding that effective backfill materials will be identified in a timely fashion.

In the National Waste Terminal Storage program a wide range of candidate backfill materials have been and are continuing to be evaluated (DOE PS II-129 to II-152). The DOE studies include measurements of the appropriate properties of backfill material including nuclide sorption capacities, capability to prevent or delay groundwater flow, thermal conductivity, mechanical strength, swelling, plastic flow and methods of backfill emplacement. Data on available candidate materials show significant radionuclide sorption capabilities and sorptive properties can be maintained at elevated temperature and in the presence of radiation (DOE CS pp. II-98, II-99). Analyses indicate that several of the materials could provide adequate performance characteristics (DOE PS, Part II, Ref. 339, 340, 346, 372, 374, 376). As an example of the development of effective engineered barriers, the results of Swedish studies on radionuclide release in a repository were cited. The studies showed that a bentonite clay backfill, in conjunction with a thick copper canister (with spent fuel inside) could prevent the release of radionuclides to the host rock in the presence of granitic ground water for thousands to hundreds of thousands of years. In the Swedish experiments, the clay barrier provided sorptive properties which

were predicted to delay the breakthrough of various radionuclides for thousands of years and also served to chemically condition the groundwater, reducing its corrosive effect on the canister (DOE PS pp. II-145, II-148). The use of certain clays to retard the transport of radionuclides released by the waste package is applicable to repository designs here in this country. While DOE has not proposed using thick copper canisters as employed in the Swedish studies, this example of a durable combination of waste package and backfill material which was demonstrated to be effective in isolating radionuclides for very long times, indicates that the basic approach is reasonable. The use of clays, combined with other appropriate materials, could provide an effective means for radionuclide retardation and corrosion control.

In sum, the Commission believes that DOE's ongoing developmental studies reported in this proceeding (DOE PS pp. II-129 to II-152) are technically sound and provide a basis for reasonable assurance that engineered barriers can be developed to isolate or retard radioactive material released by the waste package.

2. Borehole and Shaft Sealants

A major factor in repository performance is the effective sealing of boreholes and shafts during repository closure operations. All penetrations provide potential pathways for radionuclides to reach the biosphere or for groundwater to enter the repository. The penetrations must be sealed for an extended period of time. Further, the geology and hydrology at a particular site, as well as the expected temperature and pressure conditions during repository lifetime, must be understood in order to make a proper choice of the borehole and shaft sealing materials and to develop effective borehole and shaft seals.

Some participants concluded that current information concerning the technology for the sealing of the boreholes and shafts is inadequate. They also questioned the capability of the DOE program to develop sufficient information to allow effective seal design (CDC PS pp. 19-22; NRDC PS p. 5). The views of several participants who expressed concern about sealing were reflected in the comments of CDC. The Commission's response to each of the points raised by CDC on borehole and shaft sealing issues is discussed below.

CDC indicated that since long-term effects of heat and radiation on seal materials were not a factor in past oil and gas borehole sealing experience, such experience is not applicable to repository sealing*. However, at distances of more than several feet from waste canisters emplaced in a repository, radiation exposures are small and the temperature rise at seals in the shafts and boreholes is insignificant for sealing purposes (DOE CS II-108).

CDC also believes that the tests of cement seals with epoxy resins in bedded salt deposits discussed by DOE are insufficient to provide assurance of seal stability over a period of 10,000 years, especially when the effects of higher temperature and radiation are not included. As noted above, temperature and radiation effects on seals are expected to be negligible. While these tests may not provide conclusive proof of performance for 10,000 years, they are expected to provide useful information for seal development.

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*The Commission notes that the extensive oil and gas borehole sealing experience has not been concerned with very long term sealing. Therefore, DOE's sealing research and development must provide a basis to extend that experience for the development of long-term seals for a repository.

CDC states that the results of field tests described by DOE as continuing over the next few years will not be completed in time to contribute to seal design criteria which are to be completed* in 1982. However, the final seal design for the selected site is scheduled for two years after a site is selected (DOE PS p. II-184). Testing up to that date is expected to be useful in designing an effective seal.

CDC questioned whether tests of waste package system component interactions with the surrounding media in bedded salt described by DOE will be completed in time for location of a repository. However, the Commission finds no basis for this assertion in the record. The DOE program appears to be adequately addressing this issue. Studies are in progress to characterize further the interactions between candidate backfill-getter materials and waste container alloys. These studies include investigations of dry rock salt/metal interactions and high intensity radiation/salt/brine/metal interactions. (DOE PS p. II-149, II-150).

CDC asserts that DOE has not discussed designing backfill material and penetration seals to allow for safe reentry if retrieval should become necessary. However, the provision to retrieve high-level waste and spent fuel for a number of years after the repository is filled has been addressed by DOE (DOE PS pp. II-280 to II-283). Although it has not yet been established whether backfilling and sealing will be conducted before

*DOE has published "Schematic Designs For Penetration Seals For a Reference Repository In Bedded Salt," ONWI-405, November, 1982 (not in the record of this proceeding).

repository closure, these operations may be reserved until a final decision for closure is made. In any event, CDC provides no basis for concluding that providing for retrievability will necessarily create any major difficulties for the design of backfill material and penetration seals.

According to one participant, "There is no established way to seal a repository so as to prevent radionuclide release to the biosphere for the necessary period of time. DOE has termed the sealing problem a 'key unknown' but there is no consensus that the technology which is currently anticipated will provide adequate seals for even a few decades" (Consolidated States Group PHS p. 8). Other participants maintained that seals must perform as well as the host rock in preventing radionuclide migration (NRDC PS p. 55). The DOE position is that the seal should provide a barrier with sufficient integrity to ensure acceptable consequences and sealing adequacy should be determined only on a site-specific basis (DOE CS p. II-106). DOE asserted that its program will successfully resolve remaining uncertainties in repository sealing technology (DOE CS pp. II-106 to II-109).

DOE has been studying cement-based borehole plugging and has examined use of grout materials for application to the Waste Isolation Pilot Plant (WIPP) and other potential repository sites. Earth-melting technology for plugging in salt and use of compacted natural earth materials are also being investigated (DOE PS p. II-183, CS p. 106-109). There is a considerable body of experience in sealing subsurface formations in the oil, gas, and other mineral extraction industries. However, related industrial experience and requirements for sealing a repository differ in one important respect: repository sealing must be effective for a very long time while most other sealing applications are for relatively short time periods (DOE PS p. II-182). Future DOE effort will be needed to verify borehole seal performance and durability for each candidate medium. An important aspect of DOE's work is to determine the rate of degradation of seal performance as a

function of time. DOE plans to determine seal performance specifications for a particular site on the basis of calculated predictions of radionuclide release and transport to the accessible environment (DOE PS p. II-182). These predictions are expected to indicate that a site whose characteristics for waste isolation are clearly superior may not require sealing performance specifications as stringent as those for a less favorable site.

Based upon the extensive experience with shaft and borehole sealing in other industries and DOE's detailed program for evaluating the long-term performance of seals, the Commission believes that there is a reasonable basis to expect that long-term effective borehole and shaft seals can be developed.

D. Summary of Views on the Technical Feasibility of Safe Waste Disposal

The Commission notes that participants in the Waste Confidence Rulemaking proceeding have generally agreed there are no known fundamental technical problems which would make safe waste disposal impossible. Where they differ is the extent to which the technical problems of disposal technology and siting have already been solved and the capability of DOE to solve them, and particularly to solve them by 2007-09 or by the expiration date of reactor operating licenses (e.g., NY PS p. 3; NECNP PS p. 171; Minn PS pp. 13-20 of Enclosure).

The Commission believes that the record provides a basis for reasonable assurance that the key technical problems can be solved. Technically acceptable sites exist and can be found among the various types of geologic media and locations under investigation by DOE. Currently developed geophysical methods for site evaluation appear capable of adequately characterizing the site, and the residual uncertainties in earth sciences data do not seem to be an insurmountable impediment. Further, the Commission

believes that the multi-barrier approach to waste package design is sound and that package development is being adequately addressed by DOE. DOE's development work on backfill materials and sealants provides a reasonable basis to expect that backfill materials and long-term seals can be developed. Reprocessing of spent fuel would only become a licensed commercial activity if disposal of reprocessing waste in a mined repository would be established as technically feasible. While the Commission recognizes that more engineering development and site-specific work on disposal technology will have to be conducted before a waste repository can be constructed and operated, the Commission concludes that it is technically feasible to safely dispose of high-level radioactive waste and spent fuel in a mined geologic repository.

2.2 Second Commission Finding

The Commission finds reasonable assurance that one or more mined geologic repositories for commercial high-level radioactive waste and spent fuel will be available by the years 2007-09, and that sufficient repository capacity will be available within 30 years beyond expiration of any reactor operating license to dispose of commercial high-level radioactive waste and spent fuel originating in such reactor and generated up to that time.

While the record of the proceeding supports a finding that disposal is technically achievable, the Federal government has, in the past, made inadequate progress in developing sound waste management policies and programs. Although DOE has stated that a repository will begin to operate between 1999 and 2006 or sooner (DOE PHS p. 2), both technical and institutional issues contribute to uncertainties concerning DOE's ability to complete one or more mined geologic repositories for high-level radioactive waste by that time. The technical issues concern DOE's ability to find technically acceptable sites in a timely fashion and the timely development

of waste forms, packages, and engineered barriers. The institutional issues concern primarily federal-state relations and the management and funding of the Federal program.

The Commission has considered the effect of enactment of the Nuclear Waste Policy Act of 1982 and concludes that the Act helps to reduce these scheduling and institutional concerns. The Act provides support for timely resolution of technical uncertainties by: (1) establishing specific milestones for all the key tasks; (2) coordinating the activities of all the involved Federal agencies; (3) providing for time schedules and mission plans for the accomplishment of the tasks; and (4) providing a mechanism for monitoring progress, for identifying failures to meet the schedules and the milestones, and for adjusting the future elements of the program in the event that such failures occur. In order to further enhance the resolution of technical uncertainties regarding rock thermal-geomechanics the Act provides for the establishment of a Test and Evaluation facility to carry out in-situ studies of rock at repository depth. The Act also reduces uncertainties in the institutional arrangements for the participation of affected states in the siting and development of repositories and in the long-term management, direction and funding of the repository program. The Commission's assessment of both the technical and institutional factors is discussed below.

A. Technical Uncertainties

The ability to construct and operate a mined geologic repository that will provide for the safe disposal of high-level radioactive waste and spent fuel by the years 2007-09 has been challenged by several participants. In addition to the institutional issues which must be resolved, interrelated technical problems have to be solved in a coordinated and timely fashion. The Department of Energy is confident the technical problems can be solved as scheduled in the National Waste Terminal Storage Program plans (DOE PS p.

III-86, CS p. III-13). Other participants conclude that because of unresolved technical problems, DOE's schedule cannot be met (e.g., Consolidated Public Interest Group PHS pp. 2-7; Consolidated State Group PHS pp. 1-13). For convenience, we consider the technical controversy in two categories: (a) finding technically acceptable sites in a timely fashion, and (b) the timely development of waste packages and engineered barriers.

1. Finding Technically Acceptable Sites in a Timely Fashion

To assure the adequacy of a candidate site requires extensive onsite investigations including drilling or excavating, as well as analyses and technical evaluations. Although the record of this proceeding does not show that DOE has progressed far enough in site characterization to identify an acceptable site, the record does indicate that DOE's site characterization and selection program is providing information on site characteristics at a sufficiently large number and variety of sites and geologic media to support the expectation that one or more technically acceptable sites will be identified.

DOE is investigating four geologic media at a number of sites: domed salt (Gulf Interior Region); bedded salt (Paradox Basin, Permian Basin, Salina Basin); basalt (DOE's Hanford Site), and volcanic tuff (DOE's Nevada Test Site). Investigations in a fifth media (granite) are planned, but sites

have not yet been determined (DOE PS Appendix B). The status of these investigations is outlined below.*

Domed Salt: Resolution of the identified key screening issues in FY 1982 and early FY 1983 is expected to permit nomination of a candidate salt dome site in 1983. DOE is still choosing from among several salt domes in the Gulf Coast interior region (Tr. pp. 243-244).

Bedded Salt: Primary effort has been focused on the Palo Duro Basin in Texas, the Paradox Basin in Utah, and the Permian Basin, particularly the Delaware basin in the Los Medanos area, the site considered for the proposed WIPP. No field investigations have been conducted at the Salina Basin. For bedded salt sites other than Los Medanos, the environmental

*In response to the Nuclear Waste Policy Act of 1982, which was enacted on January 5, 1983, the Department of Energy is reviewing its previously established site selection milestones for compliance with the provisions of the Act. DOE has published Proposed General Guidelines for Recommendation of Sites for Nuclear Waste Repositories (48 Fed. Reg. 5670, February 7, 1983), as required by Sec. 112(a) of the Act. In the Supplementary Information accompanying the Proposed Guidelines, DOE stated that it expects to begin nominating sites in 1983 and to have recommended three sites to the President by the end of the Summer of 1983. This information is consistent with the schedule for repository development. Except where indicated, the discussion below refers to milestones presented in the record of this proceeding.

assessment was to be completed by August 1982* and the detailed site characterization plan by December 1983. The selected salt site and two additional sites selected from Hanford basalts and the Nevada Test Site tuffs were the sites at which exploratory shafts were to be constructed to repository depths. The exploratory shaft work for the selected salt site was to begin in December 1983 (Tr. pp. 241-242). In accordance with the provisions of the Nuclear Waste Policy Act of 1982, DOE published proposed guidelines** (48 Fed. Reg. 5670, February 7, 1983) stating that it will submit a site characterization plan for review by NRC and appropriate local government units, before sinking shafts for site characterization. This affects the previously announced schedules as noted below.

Basalt: The basalt formations at the Hanford reservation in the center of the Pasco basin (Columbia Plateau, central Washington) are prime candidates for repository sites. Work on an exploratory shaft for basalt was to begin in April 1983 (Tr. pp. 241-141). However, now this work is to start after completion of the environmental assessment required by the Nuclear Waste Policy Act (Sec. 112(b)(1)(E)).

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*The bedded salt site under consideration other than Los Medanos is in the Paradox Basin in Utah. The Bureau of Land Management issued the report "Environmental Assessment of DOE Proposed Location and Baseline Studies in the Paradox Basin, Utah-Final" UT-060-51-2-11, in July, 1982. Before site nomination, the Nuclear Waste Policy Act of 1982 requires completion of an environmental assessment (Sec. 112(b)(1)(E)) which is based on DOE's general guidelines for the selection of sites in various geologic media (Sec. 112(a)).

**Not a part of the record of this proceeding.

Volcanic Tuff: The Nevada Test Site offers several suitable candidates for waste repository siting. The primary focus is welded tuff on Yucca Mountain, where DOE has begun a program of drilling and geophysical evaluation. DOE expects to begin shaft work by October 1983 (Tr. p. 242).

Granite: DOE has conducted only limited investigations of granite at the Nevada Test Site (DOE PS pp. B-66, B-72), but is developing data on the potential of granite as a repository medium in collaboration with Swedish investigators (DOE PS p. II-258). This project has already produced a large amount of rock thermal-mechanics data at repository depth for use in repository designs in granite media in this county (DOE PS pp. II-258 to II-260).

As indicated in our discussion of technical feasibility, the identification of technically acceptable sites is a key problem and the date of successful solution of this problem is a critical milestone in the repository program. Those participants who believe DOE could not meet its site selection schedule asserted that determination of the acceptability of proposed repository sites requires information that will not be available when needed. They maintained that DOE's knowledge is seriously incomplete with respect to all of the potential sites considered to date. Further, they asserted that because new information could disqualify any of the potential sites, as it did at the Palestine dome, there is, as yet, no basis for reasonable assurance that an acceptable repository site will be available in the time period under consideration (NRDC PS p. 44; NECNP PS p. 24). The Commission recognizes that if the DOE program were further along, e.g., in the middle of exploratory shaft work, there would be much more site-specific information available (including the results of in-situ tests) and a firmer basis for assessing whether DOE's revised schedule can be met. However, the Commission can make a reasonable prediction with the information now before it.

Underlying the pessimism of some participants is apparently a belief that DOE's past record in solving technical problems undermines the possibility of finding confidence in DOE's ability to solve the waste disposal problems in a timely way. The Commission acknowledges that in the past the waste programs of DOE and its predecessor organizations have experienced difficulty in making timely progress toward a solution of the nuclear waste problem. However, the Commission need not rely on this past record in making its confidence determination. The DOE program is now adequately addressing the issues yet to be resolved in identifying an acceptable site and DOE's schedule is a reasonable one (see the discussion in Section 2.2 B.4 of this document). The qualifications and professional experience of the many scientists and engineers on the overview committees and peer review groups who advise and consult on the DOE program should provide confidence in DOE's efforts (DOE CS Appendix D). The support of the USGS in the earth sciences field (USGS PS Appendix A) clearly contributes to confidence that the technical problems associated with identifying an acceptable repository site will be solved. As noted before, no fundamental technical breakthroughs are necessary. Rather, completing the program is a matter of step-by-step evaluation and development based on ongoing site studies and research programs.

The Commission believes that the enactment of the Nuclear Waste Policy Act of 1982 provides impetus to that program and helps ensure that it will be completed on schedule. The Nuclear Waste Policy Act establishes a detailed step-by-step plan for developing a waste repository. The Act directs DOE to prepare a comprehensive mission plan which will establish programmatic milestones for research, development, technology demonstration and systems integration. The Act also requires the various Federal agencies involved in the program to coordinate their activities. Involved agencies must report their progress, or lack thereof, to Congress, explain any slip in schedule

and set a new schedule for activities. Thus, the Act provides a framework and schedule for developing a repository.

The schedule set forth in the Act calls for the identification of adequate sites in time to meet the final decision date on construction authorization by the NRC and well before the time at which such action would be necessary to assure repository operation within the time period discussed in this decision. The time between sinking of an exploratory shaft and the completion of site characterization contemplated by the Act (Sec. 112, 114) is 26 months, with an extension to 38 months under certain conditions; the DOE schedule for these activities is generally compatible with this schedule (see Section 2.2 B.4 below).

The Nuclear Waste Policy Act also puts in place procedures (Sec. 115, 116, 117, 118, 119) which the Commission believes will help to resolve potential institutional problems that might affect the schedule for site selection. These are discussed in detail hereafter. The Commission believes that the provisions of the Act should also provide resources (Sec. 302, 303) to adequately fund the site selection and characterization work.

Given all of these considerations, the Commission concludes that there is reasonable assurance that technical uncertainties -- unsolved technical problems and information gaps -- will be removed in time for DOE to meet its proposed schedule. DOE's program is adequate and its schedule is reasonable. The Act provides a greater degree of confidence than existed previously that site selection will proceed within the time frame that DOE has described in its position statement.

2. Timely Development of Waste Packages and Engineered Barriers

Some participants have expressed strong reservations concerning DOE's ability to develop waste forms, packages, and engineered barriers in a timely fashion. The DOE technical effort to solve problems was characterized as only just being defined in many significant areas, including the prevention of corrosion of waste canisters (NRDC PS p. 18). Other participants contended that: the design and evaluation studies of penetration seals and backfill material might not be completed soon enough to meet the goal of achieving an operational repository by 1997 to 2006; the long-term effects of heat and radiation on the integrity of the seal materials are not known; tests of cement seals with epoxy resin in bedded salt deposits are insufficient to assure stability of such seals over a period of 10,000 years; and field tests of liquid permeability during a period of three months cannot provide confidence concerning the stability of seals during a period of 10,000 years. Participants also contended that no information had yet been provided which specified the type of backfill material most suitable for specific geological media and capable of withstanding thermal stress (CDC PS pp. 19-22).

Although technical problems associated with the development of waste packages and engineered barriers could delay DOE's schedule, DOE believes that the uncertainties surrounding the waste package would be resolved or bounded as a result of implementation of its program (DOE PS p. II-160, CS p. II-96). The DOE Waste Package Program Plan (ONWI-96) which was issued in August 1980 and updated in June 1981 (NWTS-96) sets forth details of DOE's program. Waste package performance criteria will be developed in the near future. Final action on the criteria will be contingent upon the final issuance of NRC's technical criteria (10 CFR Part 60, Subpart E), the publication of the relevant regulatory guides on waste packages, and the ONWI-33 series of

criteria documents, i.e., the reports DOE/NWTS-33(1), (2), (3), "NWTS Program Criteria For Mined Geologic Disposal of Nuclear Wastes."

DOE planned to complete the waste package preliminary designs for salt in September 1982, for basalt in June 1985, for tuff in June 1984, for granite in September 1984, and for argillaceous rock in December 1984, and to establish a baseline for waste form specifications by June 1983 (ONWI-96). The waste package preliminary design for salt has been completed and a report is being prepared for publication. DOE intends to submit the baseline waste form specifications developed during the conceptual design studies for acceptance by NRC. The specifications will be subjected to configuration control for application throughout the waste processing and disposal program.

According to the program plan (ONWI-96) the waste package performance model will be verified by January 1986. Further, the program plan calls for completion of the waste package final design that takes into account the selected site environmental conditions by April 1987. The plan also indicates that qualified barrier materials are to be available by September 1985. DOE's Material Review Board will review and approve barrier materials for which a data base has been generated using standardized test procedures.

Some participants' statements are pessimistic assessments based on the fact that the DOE program has not yet reached the critical milestones -- e.g., establishment of waste form specifications, completion of waste package preliminary designs, verification of a waste package performance model, and qualification of barrier materials. However, the Commission believes that these technical problems will be solved without delaying a repository schedule. DOE has put in place an extensive nuclear waste research program that addresses each of these technical problems. Research results already reported on waste form packaging and barrier materials indicate that these research efforts, although not yet completed, can reasonably be expected to

provide solutions to those problems when those solutions are needed to meet the DOE schedule (DOE PS pp. II-129 to II-197, CS pp. II-93 to II-100).

The Commission's positive assessment is strengthened by provisions in the Nuclear Waste Policy Act of 1982. Title II of the Act authorizes DOE to undertake steps leading to the construction, operation and maintenance of a deep geologic test and evaluation facility and to establish a focused and integrated research, development and demonstration program. In the area of waste package design, the Act directs that DOE's Mission Plan identify a process for solidifying high-level radioactive waste or packaging spent fuel with an analysis of the data to support selection of the solidification process or packaging technique. The Act calls for a schedule for implementing such a plan and for an aggressive research and development program to provide a high-integrity disposal package at a reasonable price (Sec. 301(a)(8)). Congressional authorization of those programs, together with the assurance of necessary funding, provides the Commission additional confidence that the required research work will be done in a timely manner.

The Commission also notes that the programs to solve the major technical problems relating to the timely development of waste forms, waste packages, and engineered barriers can proceed in parallel. Because the waste repository must be designed as a system, the problems are interrelated; however, the relationships are such that solving one problem need not await the solution of another. DOE could proceed for a number of years on waste package development before making a decision on the form of the waste, without affecting the repository availability schedule.

B. Institutional Uncertainties

The principal institutional issues that affect the schedule for availability of a mined geologic repository include: measures for dealing with

Federal-state disputes; an assured funding mechanism that will be sufficient over time to cover the period for developing a repository; an organizational capability for managing the high-level waste program, whether this be DOE or a successor organization; and a firm schedule and establishment of responsibilities which will lead to repository development in a reasonable period of time. Each of these is discussed in turn.

1. Measures for Dealing with Federal-State-Local Concerns

The President and Congress have recognized the need to involve state and local governments in the decision-making process and have taken steps, including enactment of the Nuclear Waste Policy Act of 1982, to establish an institutional framework to accomplish this end. DOE pointed out that Presidents Carter and Reagan have considered state involvement in site selection an important aspect of the high-level radioactive waste disposal program. President Carter, in his message to Congress, directed "the Secretary of Energy to provide financial and technical assistance to States and other jurisdictions to facilitate the full participation of State and local government in review and licensing proceedings." He committed the Federal government to work with state, tribal and local governments in the siting of high level waste repositories. Within a framework of "consultation and concurrence," a host state would have a continuing role in Federal decision-making involving the siting, design and construction of a high-level waste repository (DOE CS pp. II-11, 13-14). President Reagan's statement of October 8, 1981 similarly instructed DOE to work closely with industry and state governments in developing methods of storing and disposing of commercial high-level waste.

Although industry groups believed that DOE had made substantial progress in cooperating with state and local authorities by encouraging their direct participation in planning and preliminary site selection activities

(UNWMG-EEI CS pp. V-27, V-28), states and environmental groups were skeptical that the mechanisms proposed by DOE for incorporating state and local views (e.g., consultation and concurrence) would work satisfactorily. Many states asserted a lack of confidence in DOE's claims that it would be able to gain agreement from states by persuasive measures (e.g. Ohio PS p. 5; NY PS p. 74; Wis PS Kelly p. 5) and noted that information sharing was inadequate to reduce or overcome a state's resistance to a repository (e.g., NY PS p. 74; NRDC PS p. 69). The states also believed that DOE had underestimated potential state and local opposition to the siting of a repository (CEC PS p. 27, Ohio PS p. 12) and that consultation and concurrence must include a mechanism for resolving intergovernmental disputes (Vt PS p. 3). Other participants argued that many states had already imposed bans on waste disposal (NECNP PS p. 32) and that DOE had presented no means for resolving state nonconcurrence (NRDC PS p. 69). Still others claimed that the state's role in the site selection process must be specifically defined (Del PS p. 6); but that DOE had provided no basis for optimism that this could be done (NECNP PS p. 69). Some participants suggested that local opposition to waste repositories could be overcome by providing financial compensation to nearby communities (AIChE PS p. 6) but that DOE had not adequately considered compensation to host communities for socioeconomic impacts (Ohio PS p. 14).

The recently-enacted Nuclear Waste Policy Act of 1982 defines the roles of the states and Indian tribes in repository site selection, and thereby reduces some of the uncertainties in settling disputes between the Federal government and affected States and Indian tribes. By providing for information exchange, for financial and technical assistance, and for processes of consultation, cooperation, negotiation and binding written agreement, the Act should help to minimize the potential for more formal objections and confrontations.

Specifically, the Act requires DOE to identify the states with one or more potentially acceptable sites for a repository and to notify the governing bodies of the affected states or Indian tribes of those sites (Sec. 116(a)). The Act establishes detailed procedures for consultation with the States and Indian tribes regarding repository site selection (Sec. 117). DOE, NRC and other agencies involved in the construction, operation, or regulation of any aspect of a repository in a state must provide to the state and to any affected Indian tribe, timely and complete information regarding plans made with respect to the site characterization, development, design, licensing, construction, operation, regulation, or decommissioning of such a repository (Sec. 117(a)(1)). If DOE fails to provide such information requested by the state or affected Indian tribe in a timely manner, it must cease operations at the site (Sec. 117(a)(2)). The Act also provides that DOE must consult and cooperate (Sec. 117(b)) with the affected states and Indian tribes and must enter into a binding written agreement (Sec. 117(c)) setting forth the procedures under which information transfer, consultation and cooperation is to be conducted.

Following consultation with affected states and Indian tribes, the Secretary of Energy is to recommend to the President three sites suitable for characterization as candidates for selection as the first and second repositories (by July 1, 1985 and July 1, 1989 respectively) (Sec. 112 (b), (B), (C). The President must then submit to Congress his recommendation of sites qualified for construction authorization for a first and second repository (no later than March 31, 1987 and March 31, 1990 respectively) (Sec. 114 (a)(2)(A). Following submission by the President of a recommended site to Congress, the Governor or legislature of the state, or the Indian tribe in which such site is located may disapprove the site designation and submit (within 60 days) a notice of disapproval to Congress (Sec. 116 (b) (2). The site is disapproved unless Congress passes a joint resolution within 90 days to override the state or Indian tribe disapproval (Sec. 115

(c)). The Commission recognizes that the latter provision may create uncertainty in gaining the needed approvals of repository sites from the affected states or Indian tribes. Nevertheless, the Commission believes that, on balance, this Congressional action to establish a detailed process for state and tribal involvement in the development of repositories will reduce overall uncertainties by encouraging Federal-state cooperation and by limiting the potential for formal state or Indian tribe objections that could lead to disruption of project plans and schedules. This conclusion is consistent with the views expressed by state participants in this proceeding that a mechanism for state participation, including the resolution of state objections and nonconcurrences, is necessary for state cooperation and for progress in repository development (Tr. pp. 117, 119, 120). Further, the Act fixes the point in time at which a state may raise formal objections. Once that time has passed, this should reduce uncertainties at later stages.

The Act stipulates that DOE will reimburse costs incurred by affected states and Indian tribes in participating in the activities identified above. The Act provides that the Secretary of Energy shall make financial grants (Secs. 116, 118) to each state or affected Indian tribe notified by DOE that a potentially acceptable repository site exists within its jurisdiction. These grants are made to enable the state or affected Indian tribe to participate in the review and approval activities required by the Act (Secs. 116, 117), or authorized by written agreement entered into with DOE. Further, DOE is to make financial grants (Secs. 116, 118) to each state or affected Indian tribe where a candidate site for a repository is approved, to enable the state or Indian tribe to conduct the following activities: (a) review activities taken for purposes of determining impacts of such a repository, (b) develop a request for impact assistance, (c) engage in site monitoring, testing or evaluation, (d) provide information to its residents, and (e) request information. In addition, the Act specifies that financial assistance will be provided to mitigate any economic, social, public health and safety, or

environmental impacts of the development of a repository. The Act also provides that state and local government units shall receive payments equal to the amount they would receive from taxing such site characterization and repository development activities in the same manner that they tax other real property and industrial activities (Sec. 116). By providing a tangible benefit to those localities or Indian reservations where repository sites are being investigated, this provision should address one concern frequently expressed by state and tribal organizations, and may result in a more willing acceptance of a repository site.

In sum, the Commission believes that the provisions of the Nuclear Waste Policy Act of 1982 reduce uncertainties regarding the role of affected states and Indian tribes in repository site selection and evaluation, and minimize the potential for direct confrontation between the Federal government and the states with respect to the disposal of commercial high-level waste and spent fuel. By reducing these uncertainties, the Act should help minimize the potential that differences between the Federal government and state or Indian tribes will substantially disrupt or delay the repository program. Further, as discussed previously in this Section, the decision-making process set up by the Act provides a detailed, step-by-step approach which builds in regulatory involvement. This should also provide confidence to state and Indian tribes that the program will proceed on a technically sound and acceptable basis.

2. Continuity of the Management of the Waste Program

The Commission recognizes that the waste disposal program involves activities conducted over a period of decades. Thus, there is a need for long-term stability of management and organization. The Commission's Second Prehearing Memorandum and Order of November 6, 1981, sought comments on the implications of the possible dismantling of the DOE and assignment of its functions to

other Federal agencies. In response, DOE stated: "The ability of the Federal Government to implement the waste isolation program would not be affected by the President's September 24, 1981 proposal to dismantle DOE. As demonstrated by his Nuclear Policy Statement of October 8, 1981. . . the President is committed to the swift deployment of means of storing and disposing of commercial high-level nuclear waste. Thus, some governmental unit will continue the program aggressively if DOE is dismantled" (DOE PHS p. 8). The DOE statement was amplified by the Deputy Secretary of Energy in the oral presentations on January 11, 1982: ". . . as far as the reorganization is concerned, the plan is not, I think, to do away with the activities of the Department of Energy. The plan, as it has been announced so far, is to in fact merge the activities, in particular, these activities into the Department of Commerce. And we do not visualize at this time any significant changes in the way in which the programs relating to waste management would be altered, either technically or from a management point of view" (Tr. p. 13).

The nuclear industry participants agreed with DOE's view on this question (Consolidated Industry Group PHS p. 18; AIF PHS p. 7; SE2 PHS p. 6; ANS PHS p. 8). However, state participants and intervenor groups disputed the DOE view. They saw the potential dismantlement of DOE as leading to further delay in resolution of the radioactive waste disposal problem and asserted that DOE's possible abolition made representations regarding the future success of its waste program useless (Consolidated State Group PHS, pp. 2, 9; Minn PHS pp. 6-8).

The Commission does not believe that the Administration's proposal to transfer the activities of the Department of Energy to the Department of Commerce introduces substantial new uncertainties regarding the continuity of Federal management of the nuclear waste program. As the Department of Energy stated, the Administration's proposal, if adopted, would simply transfer the

nuclear waste program functions from one Federal agency to another. Moreover, Congressional action is needed to adopt the Administration's proposal. Yet, in the more than 18 months since the Administration's proposal to dismantle DOE was made, there has been no discernible action by the Congress to proceed with adoption of the proposal. Because the Congress has not taken action toward adoption of the Administration's proposal, and because the proposal, even if adopted, would consist of only a transfer of the program from one agency to another, the Commission does not believe that the Administration's proposal constitutes a significant source of management uncertainty for the nuclear waste program.

The Commission believes that residual uncertainties regarding the continuity of Federal management of the nuclear waste program have also been reduced by the Nuclear Waste Policy Act of 1982. The Act provides for the establishment of an Office of Civilian Radioactive Waste Management within the Department of Energy. This Office is to be headed by a Director appointed by the President, with Senate confirmation, who will report directly to the Secretary of Energy (Sec. 304). Further the Act raises the activities of this Office to a high level of visibility and accountability by stipulating that an annual comprehensive report of the activities and expenditures of the Office will be submitted to Congress and that an annual audit of the Office will be conducted by the Comptroller General, who will report the results to Congress. The Act also requires two additional elements that provide added assurance of continuity: a "mission plan" and a schedule of activities for DOE. The mission plan is a detailed and comprehensive report which is intended to provide "an informational basis sufficient to permit informed decisions to be made in carrying out the repository program and the research, development, and demonstration programs required under this Act." The Secretary of Energy must submit a draft mission plan to the states, the affected Indian tribes, the Commission and appropriate government agencies for their comments not later than 15 months after enactment of the Act and,

after revising the plan, submit it to the appropriate Congressional committees not later than 17 months after enactment (Sec. 301 (a) and (b)). The schedule of DOE's activities in conducting this program was discussed in Section 2.2 A.1 above. Taken together, the provisions of the Nuclear Waste Policy Act establish a detailed management framework for the conduct of the repository program that should help ensure both sound management and continuity--whether the responsibility for the repository program is retained in DOE or is transferred to another Federal agency.

3. Continued Funding of the Nuclear Waste Management Program

There is general agreement among all participants that the program to develop a mined geologic repository for nuclear wastes will require more than a decade of effort at a total cost of several billion dollars. A steady source of funding will be needed to assure the timely success of the program. DOE pointed out that it would request an adequate level of funding for the National Waste Terminal Storage (NWTS) Program as stated in the Department's Position Statement (DOE CS p. II-30). In addition, DOE stated that Congress' commitment to the commercial waste disposal program was demonstrated by the continuous increase in the level of funding since 1976. The funding level was increased by more than a factor of 10 between 1976 and 1980 (DOE CS p. II-30). Some participants disagreed with DOE's optimism concerning the future availability of funds and pointed out that competing priorities for Federal funds could deprive DOE of the necessary resources (CDC PS p 7; Lewis PS p 9; NRDC PS p 28; Tr. p. 203).

Congress passed a continuing resolution for FY 1983 funding of DOE's nuclear waste program at the level of $259.4 million. This is about $10 million more than DOE's earlier FY 1983 request of $249 million. Additionally, the Nuclear Waste Policy Act authorizes the Secretary of Energy to enter into contracts and collect a fee of 1 mill per kilowatt-hour of electricity

generated by nuclear reactors in return for the Federal government's acceptance of title, subsequent transportation, and disposal of high-level radioactive waste or spent fuel (Sec. 302 (a)(2)). In order to be able to use a Federal repository, the Act requires the generator or owner of such waste or spent fuel to enter into a contract by June 30, 1983 or the date on which generation is commenced or title is taken, whichever occurs later (Sec. 302 (b) (2)). The Commission must require the negotiation of such contracts as a precondition to the issuance or renewal of a license (Sec. 302 (b)(1)(B)). DOE testified in the January 11, 1982 hearing that it expected the funds collected under such a program would allow support of the DOE waste program at an initial level of $185 million. Under the program subsequently adopted by the Congress, these funds are to be placed into a nuclear waste fund to support DOE's repository program. The general approach prescribed by the Act is to operate DOE's nuclear waste program on a full cost recovery basis. In this regard, the Act provides that DOE must annually review the amount of the fees established to evaluate whether collection of the fees will provide sufficient revenues to offset the costs expected. In the event DOE determines that the revenues being collected are less than the amount needed in order to recover the costs, DOE must propose to Congress an adjustment to the fee to insure full cost recovery. The Act also provides (Sec. 302(e)(5)) that, if at any time, the monies available in the Waste Fund are insufficient to support DOE's nuclear waste program, DOE will have the authority to borrow from the Treasury. The Commission believes that the continuing resolution recently passed by Congress together with the long-term funding provisions of the Act should provide adequate financial support for DOE's nuclear waste program for FY 83 and beyond.

4. DOE's Schedule for Repository Development

The DOE reference schedule establishes the earliest date of repository availability as 1997 and delineates the logic and the period of activities

that are deemed achievable under current program assumptions. While DOE acknowledges that contingency time is required in the schedule to accommodate such factors as institutional uncertainties, prolonged public hearings, or possible project reorientation, it believes that an appropriate amount of time has, in fact, been allowed in the reference schedule (DOE CS p. II-45). The extended schedule includes more time for contingencies, including the resolution of institutional concerns, extensive exploration at the repository site, an extended site selection process with long consultation and concurrence activities, and delayed construction and checkout of the repository (DOE CS pp. II-45 to II-47). Under this schedule, DOE expects that disposal facilities will be operational between 1999 and 2006 (DOE PHS p. 2).

In its oral presentation in January 1982 and its prehearing statement, DOE updated the repository development schedule. The critical milestones prior to commencing construction of the first repository are (Tr. pp. 242-244):

Mid-1982**	Commencement of exploratory shaft work* at three sites (three different media: salt, basalt and tuff)
1988	Submission of application for authorization to construct the first repository
1992	Construction authorization for the first repository

NRC's construction authorization (under 10 CFR Part 60) would mark the end of the site selection process.

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* Including borehole drilling

** An October, 1982 update of this information indicated that a pilot borehole was started in September 1982 for an exploratory shaft in tuff at the Nevada Test Site. In May 1982, DOE initiated work on surface preparation, construction of drilling pads and support buildings for the drilling operation at the BWIP basalt site. In January 1982, a borehole was begun at a point 300 feet from the BWIP planned exploratory shaft location to provide data for planning the shaft excavation. No exploratory shaft work has begun at the Paradox Basin bedded salt site. As noted in the siting discussion under the Second Commission Finding, the Nuclear Waste Policy Act of 1982 requires DOE to complete certain actions before site characterization. These include preparation of environmental assessments, notification of state and affected Indian tribes where sites are located, and holding of public hearings in the vicinity of each site. Completion of these actions may alter schedules developed prior to enactment of the Act, i.e., prior to January 7, 1983. In the Proposed General Guidelines for Recommendation of Sites for Nuclear Waste Repositories (48 Fed. Reg. 5670, February 7, 1983) published by DOE, it states that DOE expects to begin nominating sites in 1983 and to have recommended three sites to the President by the end of the Summer of 1983. None of this information is in the record of this proceeding.

Some participants believe that DOE cannot have a waste disposal facility available by 2007. These participants concluded that DOE's slow progress in the past suggests that DOE may be unable to solve the many problems that will arise in the future and that DOE's schedule for repository development is unduly optimistic (e.g., Minn. PS p. 6; Ill. PS p. 2; OCTLA PS pp. 8-9; CDC PS p. 7).

One of the primary purposes of the recently enacted Nuclear Waste Policy Act of 1982 is "to establish a schedule for the siting, construction, and operation of repositories that will provide reasonable assurance that the public and the environment will be adequately protected from the hazards posed by high-level radioactive waste and such spent nuclear fuel as may be disposed of in a repository." (Sec. 111 (b)(1)). The Commission recognizes that, if fundamental technical breakthroughs were necessary, it would not be possible for Congress to legislate their solution or specify schedules for their accomplishment. However, as discussed previously, such breakthroughs are not necessary. Rather, the remaining uncertainties are reflected in the need for step-by-step evaluation and development based on ongoing site studies and research programs. The Commission believes the Act provides means for resolution of those institutional and technical issues most likely to delay repository development, both because it provides an assured source of funding and other significant institutional arrangements, and because it provides detailed procedures for maintaining progress, coordinating activities and rectifying weaknesses. For these reasons, the Commission believes that the selection and characterization of suitable sites and the construction of repositories will be accomplished within the time frame established by the Act.

The provisions of the Nuclear Waste Policy Act of 1982 that establish schedules for repository development are elaborate and allow for various contingencies. A number of steps are involved before NRC considers

authorization of construction. DOE is to nominate five sites it believes suitable for site characterization for possible repository development (Sec. 112(b)). DOE is to recommend for site characterization three candidate sites to the President (Sec. 112 (b)(1)(B)); the President is to recommend one of the characterized sites to the Congress (Sec. 114(a)(2)(A)); the affected state or Indian tribe is given an opportunity to submit a notice of disapproval to the Congress (Secs. 115(b), (116)(b)(2), 118(a)); the Congress may overturn a state or Indian tribe disapproval of the site by passing a resolution of approval (Sec. 115(c)); and, if Congress approves or no notice of disapproval is submitted by a state or Indian tribe, then DOE is to apply for construction authorization (Sec. 114(b).

If the various procedures set forth by the Act are followed without undue delay, the application for repository construction authorization would be submitted to the Commission by mid-1987. Under the terms of the Act the Commission is expected to reach a decision within 3 years of the application date, or by mid-1990 (Sec. 114) (under certain conditions, extension by 1 year would be permitted) . If the NRC decision is favorable, the repository would be constructed and begin operation, according to DOE's "reference schedule," 69 to 102 months (5.75 to 8.5 years) after authorization, depending on the host rock type (DOE PS pp. III-9, III-85)-that is, in about early 1996 to early 1999. Similarly, DOE's "extended duration" schedule, developed before enactment of the Nuclear Waste Policy Act, would estimate repository operation 84 to 117 months (7.0 to 9.75 years) after NRC authorization or mid-1997 to mid-2000. Earlier dates can be achieved if the Presidential review time is reduced, if DOE promptly files the construction authorization application, if NRC provides a construction authorization in less than 3 years, or if DOE constructs the repository in a shorter period than provided in its estimated schedule. However, it is prudent to assume that such a contraction of the schedule will not be realized.

The Nuclear Waste Policy Act of 1982 establishes "not later than January 31, 1998" as the date when DOE is to begin disposal of high-level radioactive waste or spent fuel (Sec. 302(a)(5)(B)). This is consistent with the earlier dates of the DOE schedules discussed above and with the detailed step-by-step milestones established by the Act. The latest date (extended duration schedule, most difficult host rock) extends to mid-2000. Even if DOE is unable to shorten its schedule, the schedule established by the Act would assure the operation of the first repository well before the years 2007-2009, i.e., the period of concern in the present proceeding.

The Commission believes that the milestones established by the Act are generally consistent with the schedule presented by DOE in this proceeding and that those milestones are both realistic and achievable. Achievement of the scheduled first date of repository operation is further assured by other provisions of the Act which specify means for resolution of those institutional and technical issues most likely to delay repository completion. In addition to those provisions discussed previously, the Commission notes that the Act clarifies how the requirements of the National Environmental Policy Act are to be met (e.g., Secs. 113(c),(d); 114(a),(f); 119(a); 121(c)). The Act also requires that any Federal agency determining that it cannot comply with the repository decision schedule in the Act must notify both the Secretary of Energy and Congress, explaining the reasons for its inability to meet the deadlines. The agency must also submit recommendations for mitigating the delay (Sec. 114(e)(2)). These provisions of the Act, as well as those that support the technical program--the provisions for research, development, and demonstration efforts regarding waste disposal (Title II of the Act), increase the prospects for having the first repository in operation not later than the first few years of the next century.

The Commission also finds reasonable assurance that sufficient repository capacity will be available within 30 years beyond expiration of any reactor operating license to dispose of commercial high-level radioactive waste and spent fuel generated up to that time. The Nuclear Waste Policy Act of 1982 establishes Federal responsibility and a clearly defined Federal policy for the disposal of such waste and spent fuel and creates a Nuclear Waste Fund to implement Federal policy. The Act establishes as a matter of national policy that this responsibility is a continuing one, and provides means for the Secretary of Energy to examine periodically the adequacy of resources to accomplish this end.

The Commission notes that as of September 30, 1982, the generating capacity of all commercial nuclear power plants in the U.S. with operating licenses or construction permits was 131 electrical gigawatts (GWe) and the capacity of those under construction permit review was about 5 GWe (NUREG-0871, Vol. 1, No. 4, p. 2, 8). DOE, in its letter of March 27, 1981 to the presiding officer of this proceeding, provided an estimate of 180 GWe for the capacity of operating LWRs in the year 2000. This value is significantly lower than the value (276 GWe) presented in DOE's 1980 position statement (DOE PS p. V-4) and lower than that (202 GWe) presented in the NRC's Generic Environmental Impact Statement on spent fuel handling and storage (NUREG-0575, Vol. 1, p. 2-4). The validity of the latter predictions has been affected by the cancellations of a number of proposed units during the past two years. The DOE 1981 estimate of 180 GWe in the year 2000 appears to be a reasonable estimate of the likely installed capacity at that time. On this basis, during the 40 years of operation of each plant, using as a realistic assumption a 60 percent capacity factor, the electrical energy generation would be about 4300 GWe-years. Assuming 38 metric tons of heavy metal (MTHM) is discharged for each gigawatt-year (IRG Final Report p. D-6; NUREG-0575, Vol. 1 p. 2-4) the total discharged spent fuel from these plants would likely be about 160,000 metric tons. The capacity of each proposed

repository will depend on such factors as the thermal loading limit in waste emplacement, space limitations within the host rock, nuclear power generation capacity in the region to be serviced by the repository, and economy of scale considerations (DOE PS pp. III-70 to 79; IRG Final Report p. D-21). In its cross statement DOE's estimate that three to six repositories might be needed was based on the assumption that nuclear power generation capacity grows to 250 GWe by the year 2000 and remains at that level until 2040 (DOE CS p. II-53). The representative characteristics of each repository used by DOE were 2000 acres and a 40 to 100 kW/acre loading, corresponding to a repository capacity of about 70,000 to 170,000 metric tons of uranium, respectively (DOE PS p. III-76). Reflecting the reduction in nuclear power projections, DOE estimated in the January 1982 hearing that the ultimate reactor capacity would be about 200 GWe (Tr. p. 236). DOE then assumed a repository capacity of 100,000 metric tons and concluded that "between two and three" repositories would be needed (Tr. p. 237). To accommodate the 160,000 metric tons we have assumed, two repositories each with 100,000 metric tons capacity would appear to be sufficient.

Repository completion and operation at three-year intervals would result in having adequate capacity about three years after initial operation of the first repository (DOE PS p. III-86). As noted earlier, emplacement of spent fuel in the first repository should begin not later than the first few years of the next century. Thus, if the first repository begins to receive spent fuel in the year 2005, the second may begin operation as early as 2008, in which case all spent fuel would be emplaced by about 2026, assuming DOE's estimated receiving rates (DOE PS p. III-71) and operation of each repository as completed. Because the rate of waste emplacement during the first five years of operation would be about 1800 metric tons per year (DOE PS p. III-71), only 5400 metric tons would be emplaced in the first repository by the time the second began operation. This would satisfy the requirements of Section 114(d) of the Nuclear Waste Policy Act, i.e., the prohibition of

emplacement of more than 70,000 metric tons in the first licensed repository before the second repository is in operation. If the DOE estimated emplacement rates (which would increase to 6000 metric tons/year after the first five years) are realized, it will take about 15 years to emplace 70,000 metric tons in the first repository.

For the foregoing reasons, the Commission finds reasonable assurance that one or more mined geologic repositories for commercial high-level radioactive waste and spent fuel will be available by the years 2007-09, and that sufficient repository capacity will be available within 30 years beyond expiration of any reactor operating license to dispose of commercial high-level radioactive waste and spent fuel originating in such reactor and generated up to that time.

2.3 Third Commission Finding

The Commission finds reasonable assurance that high-level radioactive waste and spent fuel will be managed in a safe manner until sufficient repository capacity is available to assure the safe disposal of all high-level radioactive waste and spent fuel.

Nuclear power plants whose operating licenses expire after the years 2007-09 will be subject to NRC regulation during the entire period between their initial operation and the availability of a waste repository. The Commission has reasonable assurance that the spent fuel generated by these licensed plants will be managed by the licensees in a safe manner. Compliance with the NRC regulations and any specific license conditions that may be imposed on the licensees will assure adequate protection of the public health and safety. Regulations primarily addressing spent fuel storage include 10 CFR Part 50 for storage at the reactor facility and 10 CFR Part 72 for storage in independent spent fuel storage installations (ISFSI). Safety and

environmental issues involving such storage are addressed in licensing reviews under both Parts 50 and 72, and continued storage operations are audited and inspected by NRC. NRC's experience in more than 80 individual evaluations of the safety of spent fuel storage shows that significant releases of radioactivity from spent fuel under licensed storage conditions are extremely remote (see discussion in Section 2.4).

Some nuclear power plant operating licenses expire before the years 2007-09. For technical, economic or other reasons, other plants may choose, or be forced, to terminate operation prior to 2007-09 even though their operating licenses have not expired. For example, the existence of a safety problem for a particular plant could prevent further operation of the plant or could require plant modifications that make continual plant operation uneconomic. The licensee, upon expiration or termination of its license, may be granted (under 10 CFR Part 50 or Part 72) a license to retain custody of the spent fuel for a specified term (until repository capacity is available and the spent fuel can be transferred to DOE under Sec. 123 of the Nuclear Waste Policy Act of 1982) subject to NRC regulations and license conditions needed to assure adequate protection of the public. Alternatively, the owner of the spent fuel, as a last resort, may apply for an interim storage contract with DOE, under Sec. 135 (b) of the Act, until not later than 3 years after a repository or monitored retrievable storage facility is available for spent fuel. For the reasons discussed above, the Commission is confident that in every case the spent fuel generated by those plants will be managed safely during the period between license expiration or termination and the availability of a mined waste repository for disposal.

To assure the continuity of safe management of spent fuel, the Commission, in a separate action, is preparing an amendment to 10 CFR Part 50 which would require licensees of operating nuclear power reactors to submit, no later than 5 years before expiration of the reactor operating license, written

notification to the Commission, for its review and approval, of the actions which the licensee will take to manage and provide funding for the management of all irradiated fuel at the reactor site following expiration of the reactor operating license, until ultimate disposal of the spent fuel in a repository. The licensee's notification will be required to specify how the licensee will fund the financial costs of extended storage or other disposition of spent fuel. It is possible for the funding of the storage to be provided by an internal reserve fund or special assessment during that 5-year period to cover the costs of storage of the spent fuel after the expiration of the reactor operating license. The storage costs are not large relative to power generation costs. A representative figure is $1-million/year for storage of spent fuel in reactor basins beyond the operating license expiration (Addendum 2 to "Technology, Safety and Costs of Decommissioning a Reference BWR Power Station," NUREG/CR 0130; Addendum 1 to Technology, Safety and Costs of Decommissioning a Reference PWR Power Station," NUREG/CR 0672 (to be published in June, 1983)).*

Additional assurance that the conditions necessary for safe storage will be maintained until disposal facilities are available is provided by the Commission's authority to require continued safe management of the spent fuel past the operating license expiration or termination (10 CFR § 50.82). If a utility should have technical problems in continuing its commitment to maintain safe storage of its spent fuel, NRC as the cognizant regulatory agency would intervene and the utility would be required to assure safe storage. If a licensee fails financially, or otherwise must cease its operations, the cognizant state public utility commission would be likely to

*Not a part of the record of this proceeding.

require an orderly transfer to another entity. The successor would take over the licensee's facilities and, provided the conditions for transfer of licenses prescribed in NRC regulations (10 CFR §50.80) were met by the succeeding entity, operation of the original licensee's facilities would be permitted to continue. Moreover, an orderly transfer to a successor organization would be mandatory to protect the substantial capital investment. The Commission believes that the possibility of a need for Federal action to take over stored spent fuel from a defunct utility or from a utility that lacked technical competence to assure safe storage is remote, although the authority for such action exists (Section 186c and 188 of the Atomic Energy Act of 1954, as amended; 42 USC §§ 2236, 2238).

Interim storage capacity may be required for plants whose operating licenses expire or are terminated before sufficient repository capacity is available. As discussed in the rationale for the fifth finding, the Nuclear Waste Policy Act of 1982 includes a number of provisions to assure the availability of interim storage capacity for spent fuel during the period before repository operation (Secs. 131 through 137). Provisions are made for Federal government supplied interim storage capacity (up to 1900 metric tons) for civilian power reactors whose owners cannot reasonably provide adequate storage capacity.

In all cases where the interim storage is at a licensee's site, safe management will be assured by compliance with NRC regulations and specific license conditions. Where DOE provides the interim storage capacity, except in the use of existing capacity at Government-owned facilities, DOE is to "comply with any applicable requirements for licensing or authorization" (Sec. 135(a)(4)). If existing federally-owned storage facilities are used, NRC is required to determine "that such use will adequately protect the public health and safety" (Sec. 135(a)(1)). These provisions of the Act

would assure that spent fuel will be managed in a safe manner until repository capacity is available. Facilities for reprocessing high-level waste, should any be constructed or become operational before a repository is available, would be licensed under 10 CFR Part 50, and solidification and interim storage of high level waste would be provided for at such facilities. For the foregoing reasons, the Commission finds reasonable assurance that high-level waste and spent fuel will be managed in a safe manner until sufficient repository capacity is available for its safe disposal.

2.4 Fourth Commission Finding

The Commission finds reasonable assurance that, if necessary, spent fuel can be stored safely and without significant environmental effects for at least 30 years beyond the expiration of reactor operating licenses at reactor spent fuel storage basins, or at either onsite or offsite independent spent fuel storage installations.

Although the Commission has reasonable assurance that at least one mined geologic repository will be available by the years 2007-09, the Commission also realizes that for various reasons, including insufficient capacity to immediately dispose of all existing spent fuel, spent fuel may be stored in existing or new storage facilities for some periods beyond 2007-09. The Commission believes that this extended storage will not be necessary for any period longer than 30 years beyond the term of an operating license. For this reason, the Commission has addressed on a generic basis in this decision the safety and environmental effects of extended spent fuel storage at reactor spent fuel storage basins or at either onsite or offsite spent fuel storage installations. The Commission finds that spent fuel can be stored safely and without significant environmental effects for at least 30 years beyond the expiration of reactor operating licenses. To ensure that spent fuel which remains in storage will be managed properly until transferred to

DOE for disposal, the Commission is proposing an amendment to its regulations (10 CFR Part 50). The amendment will require the licensee to notify the Commission, five years prior to expiration of its reactor operating license, how the spent fuel will be managed until disposal.

The Commission's finding is based on the record of this proceeding which indicates that significant releases of radioactivity from spent fuel under licensed storage conditions are highly unlikely. It is also supported by the Commission's experience in conducting more than 80 individual safety evaluations of storage facilities.

The safety of prolonged spent fuel storage can be considered in terms of four major issues: (a) the long-term integrity of spent fuel under water pool storage conditions, (b) structure and component safety for extended facility operation, (c) dry storage, and (d) potential risks of accidents and acts of sabotage at spent fuel storage facilities. Each of these issues is discussed separately below, in light of the information provided by the participants in this proceeding, NRC experience in regulating storage of spent fuel, and, in the case of dry storage, the extra-record information described below in Section 2.4.C.

A. Long-Term Integrity of Spent Fuel Under Water Pool Storage Conditions

The Commission finds that the cladding which encases spent fuel is highly resistant to failure under pool storage conditions. As noted by DOE in its Position Statement, there are up to 18 years of continuous storage experience for zircaloy-clad fuel and 12 years continuous storage experience for stainless-clad fuel. Corrosion studies of irradiated fuel at 20 reactor pools in the United States suggest that there is no detectable degradation of zircaloy cladding (DOE PS p. IV-73). Data from corrosion studies of spent fuel stored in Canadian pools also support this finding (A.B. Johnson, Jr., "Behavior of Spent Nuclear Fuel in Water Pool Storage," (UC-70) Battelle Pacific Northwest Laboratories (BNWL-2256, September, 1977) pp. 10-11, 17).

The long-term integrity of spent fuel in storage pools, which has been confirmed by observation and analysis, was cited by industry participants (e.g., Consolidated Industry Group: PHS pp. 3-6; UNWMG-EEI PS Doc. 4, p. 8). No degradation has been observed in commercial power reactor fuel stored in onsite pools in the United States. Extrapolation of corrosion data suggests that only a few hundredths of a percent of clad thickness would be corroded after 100 years (A.B. Johnson, Jr., "Utility Spent Fuel Storage Experience," PNL-SA-6863, presented at the American Nuclear Society's Executive Conference

on Spent Fuel Policy and its Implications, Buford, Georgia (April 2-5, 1978). The American Nuclear Society cited a study (G. Vesterbend and T. Olsson, BNWL-TR-320, May 1978, English Translation of RB78-29), which concluded that degradation mechanisms such as general corrosion, local corrosion, stress corrosion, hydrogen embrittlement, and delayed hydrogen cracking are not expected to produce degradation to any significant extent for 50 years (ANS PS p. 34).

Canadian experience, including occasional examination during 17 years of storage, has indicated no evidence of significant corrosion or other chemical degradation. Even where the uranium oxide pellets were exposed to pool water as a result of prior damage of the fuel assembly, the pellets have been inert to pool water, an observation also confirmed by laboratory studies ("Canadian Experience with Wet and Dry Storage Concepts," presented at the American Nuclear Society's Executive Conference on Spent Fuel Policy and Its Implications, Buford, Georgia (April 2-5, 1978)). Another Canadian study concluded that "50 to 100 years under water should not significantly affect their [spent fuel bundles] integrity" (Walker, J.F., "The Long-Term Storage of Irradiated CANDU Fuel Under Water," AECL-6313 Whiteshell Nuclear Research Establishment, January 1979). This appraisal was based on findings such as no deterioration by corrosion or mechanical damage during 16 years of storage in water, no release of fission products from the uranium dioxide matrix during 11 years of storage in water, and no fission-product induced stress corrosion cracking anticipated during water storage at temperatures below 100°C (Hunt C.E.L., J.C. Wood and A.S. Bain, "Long-Term Storage of Fuel in Water" AECL-6577, Chalk River Nuclear Laboratories, June 1979).

The ability of spent fuel to withstand extended water basin storage is also supported by metallurgical examination of Canadian zircaloy clad fuel after 11 years of pool storage, metallurgical examination of zircaloy clad PWR and BWR high burn-up fuel after five and six years in pool storage, and return of

Canadian fuel bundles to a reactor after 10 years of pool storage. Periodic hot cell examination of high burn-up PWR and BWR bundles over 6 years of pool storage at the WAK Fuel Reprocessing Plant in Germany has also confirmed that spent fuel maintains its integrity under pool storage conditions. Other countries having favorable experience with pool storage of zircaloy-clad spent fuel include: the United Kingdom, 13 years; Belgium, 12 years; Japan, 11 years; Norway, 11 years; West Germany, 9 years; and Sweden, 7 years (op. cit., A. B. Johnson, Jr., p. 7). Programs of monitoring spent fuel storage are being conducted in Canada, the United Kingdom and the Federal Republic of Germany (DOE PS pp. IV-59 to IV-61; UNWMG-EEI PS Doc. 4, p. 23).

The only fuel failures which have occurred in spent fuel pools involved types of fuel and failure mechanisms not found at U.S. commercial reactor facilities, e.g., degradation of zircaloy-clad metallic uranium fuel from the Hanford N-Reactor as a result of cladding damage in the fuel discharge system. The system differs from the fuel discharge systems of commercial reactors. Moreover, metallic uranium fuel is not used in commercial power reactors. NRDC cited an instance of fuel failure which involved stainless-steel-clad gas-cooled reactor fuel (NRDC PS p. 92). This is not pertinent to pool storage of commercial spent fuel since the high temperature conditions in a gas-cooled reactor which can cause sensitization of the cladding are not experienced by fuel in boiling or pressurized water reactors (op. cit., A.B. Johnson, Jr., pp. 17-18).

Some participants did not agree that there is an adequate basis for confidence in safe extended-term spent fuel storage. Although agreeing with the extent of experience cited by DOE and other participants, the National Resources Defense Council, for example, stressed that more experience is needed before one can be confident of safe extended storage. NRDC considered the length of storage experience cited by DOE as insufficient to establish that spent fuel can be stored safely for periods well in excess of 40 years

(NRDC PS pp. 88-92). A similar position was taken by the State of Minnesota (Minn PHS pp. 8-9). NRDC referred to the problem of the long-term storage of spent fuel reported in the Windscale Inquiry Report by the Hon. Mr. Justice Parker, Vol. 1, pp. 29-30. However, the conclusion quoted from the report, when taken in context, refers only to irradiated fuel from AGR (advanced gas-cooled) nuclear power plants. As noted earlier, the conditions to which the fuel cladding is exposed in gas-cooled reactors differs from those in U.S. commercial light water reactors. Moreover, the cladding of AGR fuel is identified as stainless steel in the Windscale Inquiry Report. Only two commercial LWR nuclear power plants operating in the U.S. today use stainless steel clad. Most U.S. nuclear fuel is zircaloy clad, and reactor operators have not seen evidence of degradation of LWR spent fuel, either zircaloy or stainless steel clad, in storage pools (Nuclear Technology, "Spent Fuel Storage Experience," A.B. Johnson, Jr., p. 171, Vol. 43, Mid-April 1979). Further, as stated earlier, cladding degradation caused by stainless steel sensitization in an AGR high temperature environment is not pertinent to the lower temperature environment of LWR's. Therefore, the problem of long-term storage of spent fuel reported in the Windscale Inquiry is not relevant to U.S. spent fuel.

After expiration of a reactor operating license, the fuel storage pools at the reactor site would be licensed under 10 CFR Part 72. The requirements of 10 CFR Part 72 provide for operation under conditions involving a careful control of pool water chemistry to minimize corrosion. The required monitoring of the pool water would provide an early warning of any problems with defective cladding, so that corrective actions may be taken. Experience indicates that, under licensed storage conditions, significant releases of radioactivity are highly unlikely. The Commission is confident that the regulations now in place will assure adequate protection of the public health and safety and the environment during the period when the spent fuel is in storage ("Final Generic Environmental Impact Statement on Handling and

Storage of Spent Light Water Power Reactor Fuel," NUREG-0575, August 1979: Vol. 1, pp. ES-12, 4-10 to 4-17).

Although confidence that spent fuel will maintain its integrity during storage for an additional 30 years beyond the facility's license expiration date involves an extrapolation of experience by a factor of two or three in time, the extrapolation is made for conditions in which corrosion mechanisms are well understood. Technical studies cited above support the conclusion that corrosion would have a negligible effect during several decades of extended pool storage. The Commission finds that this extrapolation is reasonable and is consistent with standard engineering practice.

B. Structure and Component Safety for Extended Facility Operation For Storage of Spent Fuel in Water Pools

Questions were raised concerning the adequacy of structural materials and components of spent fuel storage basins to function effectively during periods that are double those assumed in the base design. This concern was expressed in connection with the possible necessity for longer storage times if permanent disposal is not available by the year 2006 (Del PS p. 4). The experience at the General Electric Company Morris Operation in Illinois, where a mechanical failure caused contaminated water to leak into the environment, was cited as an example of an unforeseen failure that could jeopardize the safety of spent fuel storage (NECNP PS p. 65). A generic problem regarding pipe cracks in borated water systems at PWR plants was also cited as evidence of uncertainty that long-term interim storage would be safely accomplished without modification and fuel shuffling (NECNP PS p. 64.). The Commission notes that the latter problem was discussed in detail in the Atomic Safety and Licensing Board Notification, "Pipe Cracks in Stagnant Borated Water Systems at PWRs" dated August 14, 1979, in the ASLB consideration of a proposed licensing amendment to permit modification of a

spent fuel storage pool [11 NRC 245 (1980)]. The Notification referred to by NECNP indicated that cracks had occurred in safety-related type-304 stainless steel piping systems which contained stagnant borated water. Apparently, the cracking was attributable to stress corrosion caused by the residual welding stresses in heat-affected zones. The NRC staff review found that such cracking was not directly related to spent fuel pool modifications, and that necessary repairs could be readily made. The staff concluded that cracks in low-pressure spent fuel cooling systems do not have safety significance.

Extensive experience with storage pool operation has demonstrated the ability of pool components to withstand the operating environment (DOE CS pp. II-145 to II-148). In the relatively few cases of equipment failure, pool operators have been able to repair the equipment or replace defective components promptly (UNWMG-EEI PS Doc. 4, p. 25). The Commission finds no reason why spent fuel storage basins would not be capable of performing their cooling and storage functions for a number of years past the design-basis period of 40 years if they are properly maintained.

As one participant pointed out,"...the pool structure as well as the racks are designed to withstand extreme physical conditions set forth in NRC licensing requirements. These include seismic, hydrologic, meteorological and structural requirements" (UNWMG-EEI PS Doc. 4 p. 25). The design requirements are set forth in 10 CFR Parts 50 and 72. The design-basis siting conditions for storage pools at reactor sites are those of the reactor itself. Siting conditions are reviewed by the NRC staff, the Advisory Committee on Reactor Safeguards and the Atomic Safety and Licensing Board at the construction permit stage and then reviewed again in connection with the issuance of the facility's operating license. In issuing a power reactor operating license, the Commission is, in effect, expressing its confidence that the design-basis siting conditions will not be exceeded during the 40-year license period. If pool storage facilities were used to store spent

fuel after expiration of reactor operating licenses, the utilities would be able, as part of their continuing maintenance of storage facilities, to replace defective components in a timely way, if needed, so as to avoid any safety problems. Some participants, (e.g., NECNP PS pp. 63-63; Minn PHS pp. 8-9; and Del PS p. 4), do not place the same weight which the Commission does on experience at spent fuel storage facilities and on studies cited by DOE and certain others which support the argument that the structural integrity of these basins can be readily maintained (DOE CS pp. II-145, III-13; UNWMG-EEI PS Doc. 4 p. 19). The disagreements appear to center largely on the extent to which present experience may be relied upon as a basis for predicting the safety of spent fuel storage over a period two or three times the design period.

The degradation mechanisms involved in spent fuel pool storage are well understood. The resulting changes in fuel cladding and pool systems and components are gradual and thus provide sufficient time for the identification and development of remedial action without subjecting plant personnel or the public to significant risk. The fuel storage racks are designed to maintain their integrity for many decades; if they fail in any way, they may be replaced. There are a number of routine and radiologically safe methods for maintenance at spent fuel storage basins to ensure their continued effective performance. These include replacing racks or other components, or moving spent fuel to another storage facility. The Commission finds that the extensive operating experience with many storage pools adequately supports predictions of long-term integrity of storage basins.

The Commission concludes that the experience with spent fuel storage provides an adequate basis for confidence in the continued safe storage of spent fuel in water pools either at or away from a reactor site for at least 30 years after expiration of the plant's license.

C. Safety of Dry Storage of Spent Fuel

While the record of this proceeding has focussed on water pool storage, the Commission notes that dry storage of spent fuel has also been addressed to a limited extent (e.g., DOE PS pp. IV-12 to IV-22 and IV-63 CS p. II-147, PHS p. 9; UNWMG-PS Doc 4 pp. 16-17 and CS pp. III-6-7; Tr. pp. 69-72). The NRC's regulation 10 CFR Part 72 specifically covers dry storage of spent fuel (Section 72.2(c)), and experience with dry storage was a subject of public comment in the rulemaking ("Analysis of Comments on 10 CFR Part 72," NUREG-0587, pp. II-12 to II-13). NRC reports, the "Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel" (NUREG-0575) and "Dry Storage of Spent Nuclear Fuel, A Preliminary Survey of Existing Technology and Experience" (NUREG/CR-1223) which have been referenced in this proceeding, examined potential environmental impacts and experience with interim dry storage of spent fuel. The GEIS (Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel, NUREG-0575, Vol. 1, p. 8-2, August, 1979) contained the conclusion that the use of alternative dry passive storage techniques for aged fuel, now being investigated by the Department of Energy, appears to be as feasible and environmentally acceptable as storage of spent fuel in water basins. Prior to the adoption of Part 72, dry storage of irradiated fuel had been licensed under Part 50 at the Hallam sodium graphite reactor. Dry storage is also presently licensed under Part 50 at the Ft. St. Vrain high temperature gas reactor.

Although the number of years of experience with dry storage systems is less than that with water pool storage, the understanding of some of the material degradation processes experienced in water pool storage should be applicable to dry storage. As discussed below, dry storage involves a simpler

technology than that represented by water basin storage systems.* Water basin storage relies upon active systems such as pumps, renewable filters, and cooling systems to maintain safe storage. Favorable water chemistry must also be maintained to retard corrosion. On the other hand, dry storage reduces reliance upon active systems and does not need water which together with impurities may corrode spent fuel cladding. With convective circulation of an inert atmosphere in a sealed dry system, there is little opportunity for corrosion.** For these reasons, the Commission believes that safe dry storage should be achievable without undue difficulty. New dry storage experience with light water reactor (LWR) fuel is becoming available for examination, and the evaluations discussed below suggest that the favorable results of up to almost two decades of dry storage experience with non-LWR spent fuel can also be obtained for LWR spent fuel in adequately designed dry storage installations.

Although not a part of this proceeding record, a recent review of dry storage experience by A. B. Johnson, Jr., et al. in "Behavior of Spent Nuclear Fuel and Storage Components in Dry Interim Storage" (PNL-4189, August 1982), provides an update of dry storage activities, particularly with respect to zircaloy-clad spent fuel. In this report, (pp. 18-24) the experimental data

*See, for example, K. Einfeld and J. Fleisch, "Fuel Storage in the Federal Republic of Germany; and R. J. Steffen and J. B. Wright, "Westinghouse Advanced Energy Systems Division," Proceedings of the American Nuclear Society's Topical Meeting on Options for Spent Fuel Storage, in Savannah, Georgia, September 26 through 29, 1982; also A. B. Johnson, Jr., E. R. Gilbert, and R. J. Guenther, "Behavior of Spent Nuclear Fuel and Storage System Components in Dry Interim Storage," PNL-4189, August 1982. These reports are not in the record of this proceeding.

**K. Einfeld and J. Fleisch, Ibid, p. 3.

base for non-zircaloy-clad spent fuel, including stainless steel clad fuel and the data base for zircaloy-clad fuel are discussed. Tests conducted to verify the integrity of zircaloy cladding have not indicated any degradation in dry storage (p. 27). In summary, the report states (pp. 44-45):

> "Operating information is available from fueled dry well, silo, vault, and metal cask storage facilities. Maximum operational histories are:
>
> | | All Fuel | Zircaloy-Clad Fuel |
> |---|---|---|
> | Dry wells | up to 18 yr | up to 3 to 4 yr |
> | Vaults | up to 18 yr | up to 1 yr |
> | Silos | up to 7 yr | up to 7 yr |
> | Metal casks | -- | <1 yr |
>
> All times related to 1982.
>
> Operational history with interim storage in metal casks is minimal; however, there is extensive experience with metal shipping casks. In addition, metal storage casks have been designed and tested, and cask tests with irradiated fuel are currently under way in the Federal Republic of Germany and are planned in Switzerland and the United States. The integrity of zircaloy-clad fuel in a given demonstration test is relevant to predicting fuel behavior in other dry storage concepts under similar conditions."

Information on experience with dry cask storage in other countries is also becoming available. K. Einfeld and J. Fleisch's paper, "Fuel Storage in the Federal Republic of Germany" discussed the results of dry storage research on spent fuel in an inert atmosphere. They note on page 3 of their report:

> "Several tests have been conducted to verify the integrity of LWR spent fuel cladding in dry storage. To date none of the integrity tests has indicated that the cladding is degrading during long-term storage. Even under conditions more severe than in the casks, the fuel shows no cladding failures. From the tests listed in Table II it can be concluded that dry storage under cask conditions even with starting temperatures to 400° C is not expected to cause cladding failures over the interim storage period."

Einfeld and Fleisch continue, in their report (pp. 3-4) to comment on the successful demonstration of cask storage:

> "A technical scale demonstration program with a fueled CASTOR cask is underway in the FRG since March 1982. The 16 assemblies which are subject to that program originate from the Wurgassen boiling water reactor. They resided in the core during 1 cycles of operation, burning up to about 27.8 GWD/t U.
>
> The general objectives of the demonstration with a fully instrumented cask and fuel bundles are the verification of cask design parameters, the operational experience in cask handling and the expansion of the data base on fuel performance. Fig. 2 shows a schematic drawing of the cask design and the axial thermocouple locations.
>
> The operational experiences and corresponding test data confirm the assumptions made about the cask concept and the cask loading and handling procedure. In addition, the technology data base for operating an interim storage plant could be expanded.
>
> - In-pool loading of a large storage cask and specific cask handling has been successfully demonstrated.
> - The passive heat transfer capabilities of the cask and fuel cladding integrity have been verified. The maximum local fuel rod temperatures for fuel with about one year decay time were within the expected range.
> - The total radiation shielding characteristics ($<$10 mrem/h) are verified in practice" (references deleted).

The authors conclude:

> "The realization of the transport/storage cask concept, which is well under way in the Federal Republic of Germany, will provide sufficient interim spent fuel storage capacity with the facilities planned or under construction. Dry interim storage is a proven technology and thus it constitutes an essential step in closing the backend of the nuclear fuel cycle."

R. J. Steffens and J. B. Wright's paper*, "Drywell Storage Potential," discussed drywell storage experience with pressurized water reactor spent fuel at the Nevada Test site. On page 6 of the paper, the authors note:

> "Another drywell performance assessment method being employed during the demonstration storage period is that of periodically monitoring the storage canister atmosphere for fission products, specifically krypton-85 gas. Samples drawn to date have shown no detectable concentrations of this product after approximately 3 years of storage, indicating a maintenance of the fuel cladding integrity."

A third paper presented at the same Topical Meeting, by E. R. Gilbert and A. B. Johnson, Jr., "Assessment of the Light-Water Reactor Fuel Inventory for Dry Storage," focuses on dry spent fuel storage with respect to an acceptable temperature range for storage in air. They conclude on page 8 of their report:

> "Dry storage demonstrations now in progress suggest that by 1986 a major fraction of the U.S. PWR spent fuel inventory that was placed in water storage before 1981 can be stored in dry storage facilities below 150 to 200° C.
>
> The LWR fuel inventory offers good prospects that the thermal characteristics of consolidated fuel will be acceptable for dry storage by proper selection of fuel.
>
> Dry storage of LWR fuel with defective cladding may be tolerable in inert cover gases or at temperatures below the threshold for significant oxidation in oxidizing cover gases. The range of acceptable storage temperatures is being investigated."

*Proceedings of the American Nuclear Society's Topical Meeting on Options for Spent Fuel Storage, in Savannah, Georgia, September 26 through 29, 1982 (this report is not a part of the record of the Waste Confidence proceeding).

With respect to dry storage of spent fuel, the Commission notes the summary statement from A. B. Johnson, Jr., et al., "Behavior of Spent Nuclear Fuel and Storage Components in Dry Interim Storage" (PNL-4189), page xvii:

> "Operational problems in vaults and dry wells have been minor after up to 18 yr. of operation (in 1982); and 7 yr of silo experience suggests that decades of satisfactory operation can be expected. Demonstration tests with irradiated fuel in metal storage casks are just beginning, but metal shipping casks with mild steel chambers have been used since the mid-1940s. Metal storage/shipping casks have successfully survived fire, drop, and crash tests."

Thus, with respect to the storage of spent fuel under dry conditions at storage installations located either at reactor sites or away from reactor sites, the Commission believes that current dry-storage technology is capable of providing safe storage for spent nuclear fuel. The modular character of dry storage installations enhances the ability to perform maintenance or to correct mechanical defects, if any should occur. The Commission is confident that its regulations will assure adequate protection of the public health and safety and the environment during the period when the spent fuel is in storage.

The Commission notes that section 211(2)(B) of the Nuclear Waste Policy Act authorizes the Secretary of Energy to carry out research on, and to develop facilities to demonstrate, dry storage of spent nuclear fuel. Although this provision indicates a judgment on the part of the Congress that additional research and demonstration is needed on the dry storage of spent fuel, the Commission believes the information discussed above is sufficient to reach a conclusion on the safety and environmental effects of extended dry storage. All areas of safety and environmental concern (e.g., maintenance of systems and components, prevention of material degradation, protection against accidents and sabotage) have been addressed and shown to present no more potential for adverse impact on the environment and the public health and safety than storage of spent fuel in water pools.

The technical studies cited above support the conclusion that corrosion would have a negligible effect during several decades of extended dry storage. The Commission's confidence in the safety of dry storage is based on an understanding of the material degradation processes, rather than merely on extrapolation of storage experience - together with the recognition that dry storage systems are simpler and more readily maintained. For these reasons, the Commission is confident that dry storage installations can provide continued safe storage of spent fuel at reactor sites for at least 30 years after expiration of the plant's license.

D. Potential Risks of Accidents and Acts of Sabotage at Spent Fuel Storage Facilities

The Commission finds that the risks of major accidents at spent fuel storage pools resulting in off-site consequences are remote because of the secure and stable character of the spent fuel in the storage pool environment, and the absence of reactive phenomena--"driving forces"--which may result in dispersal of radioactive material. Reactor storage pools and independent spent fuel storage installations have been designed to safely withstand accidents caused either by natural or man-made phenomena. Even remote natural risks such as earthquakes and tornados and the risks of human error such as in handling or storing spent fuel are addressed in the design and operational activities of storage facilities and in NRC's licensing reviews thereof under its regulations. Under 10 CFR Parts 50 and 72, spent fuel is stored in facilities structurally designed to withstand accidents and external hazards, such as those cited above, and to preclude radiation and radioactive material emissions from spent fuel that would significantly endanger the public health and safety. In order to preclude the possibility of criticality under normal or accident conditions, the spent fuel is stored in racks designed to maintain safe geometric configurations under seismic conditions. The spent fuel itself consists of solid ceramic pellets which

are encapsulated in metal clad rods held in gridded assemblies and stored underwater in reinforced concrete structures or in sealed dry storage installations such as concrete dry wells, vaults and silos or massive metal casks. The properties of the spent fuel (which in extended storage has decayed to the point where individual fuel assemblies have a heat generation rate of several hundred watts or less) and of the benign storage environment result in spent fuel storage being an activity with very little potential for adversely affecting the environment and the public health and safety. While any system employing high technology is subject to some equipment breakdowns or accidents, water pool storage facilities have operated with few serious problems (DOE PS at II-56 to II-57; UNWMG-EEI PS Doc. 4 p. 26). In these cases, the events at spent-fuel pools have been manageable on a timely basis. Similarly, dry storage of spent fuel, as discussed in Section (C) above, appears to be at least as safe as water pool storage. A discussion of risks related to spent fuel storage is provided below.

Comments from participants on the subject of accidents and their potential consequences at spent-fuel storage facilities included a description of nonspecific references to numerous "accidents" in spent-fuel storage facilities, a discussion of cases of leaks and inadvertent releases of contaminated storage pool water, and a suggestion that waste storage should be physically separated from reactor operation to reduce the risk of damage to the storage facility in the event of a reactor accident, and vice versa (NY PS pp. 102-107; OCTLA PS p. 12). The State of New York, in its discussion of possible accidents at spent-fuel storage pools, cited reports of an accident in the Soviet Union that is believed to have involved reprocessing plant wastes stored in tanks at a waste storage facility (NY PS pp. 107-108). The situation, as reconstructed from limited data, cannot be compared to the storage of ceramic fuel in metal cladding, placed in water storage pools. The issue raised, therefore, is not relevant to this proceeding. The need for continued management of pool storage facilities

over an extended time period was considered by some participants as creating a potential hazard because of the increased possibility of human errors or mismanagement (NRDC PS pp. 89-90). The State of New York characterized the Three Mile Island reactor accident as caused by multiple technical and human failures, and postulated that such failures are possible at storage facilities, and would result in serious off-site consequences (NY PS p. 107).

These observations do not appear to take account of the numerous safety analyses that have been made of water pool storage and of alternative long-term storage methods which have demonstrated storage to be both safe and environmentally acceptable. Of course, the possibility of human error cannot be completely eliminated. However, Commission regulations (e.g., 10 CFR Part 55; 10 CFR Part 72, Subpart I) include explicit requirements for operator training, the use of written procedures for all safety-related operations and functions in the plant, and certification or licensing of operators, with the objective of minimizing the opportunity for human error. Unlike the accident at the Three Mile Island reactor, human error at a spent fuel storage installation does not have the capability to create a major radiological hazard to the public. The absence of high temperature and pressure conditions that would provide a driving force essentially eliminates the likelihood that an operator error would lead to a major release of radioactivity (DOE CS pp. II-156 to 158). In addition, features incorporated in storage facilities are designed to mitigate the consequences of accidents caused by human error or otherwise (DOE PS IV-34).

The possibility of terrorist attacks on nuclear facilities was advanced as an argument against the acceptability of extended interim storage of spent fuel (NRDC PS p. 90). The intentional sabotage of a storage pool facility is possible, and NRC continues to implement actions to further improve security at such facilities. The consequences would be limited by the realities that, except for some gaseous fission products, the radioactive content of spent

fuel is in the form of solid ceramic material encapsulated in high-integrity metal cladding and stored underwater in a reinforced concrete structure. Under these conditions, the radioactive content of spent fuel is relatively invulnerable to dispersal to the environment (Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel, NUREG-0575, Vol.1.). Similarly, dry storage of spent fuel in dry wells, vaults, silos and metal casks is also relatively invulnerable to sabotage and natural disruptive forces, because of the weight and size of the sealed, protective enclosures which may include 100-ton steel casks, large concrete lined near-surface caissons and surface concrete silos (NUREG/CR-1223, p. IV-C-2).

E. Summary

In summary, the Commission finds that spent fuel can be stored safely at independent spent-fuel storage installations or at reactor sites for at least 30 years beyond the expiration of reactor operating licenses. This finding is based on extensive experience and on many factors that are not site-specific. These factors include the substantial capability of the fuel cladding to maintain its integrity under storage conditions, a capability verified in extensive technical studies and experience; the extreme thermal and chemical stability of the fuel form, enriched uranium oxide pellets; the long-term capability of spent fuel storage facilities to dissipate spent fuel heat and retain any radioactive material leakage; and the relatively straightforward techniques and procedures for repairing spent fuel storage structures, replacing defective components or equipment, or undertaking other remedial actions to assure containment of radioactivity (A.B. Johnson, Jr., "Behavior of Spent Nuclear Fuel in Water Pool Storage", (UC-70) Battelle Pacific Northwest Laboratories (BNWL-2256, September, 1977)). These factors contribute to the assurance that spent fuel can be stored for extended periods without significant impact on the public health and safety and the

environment. Moreover, any storage of spent fuel at independent spent fuel storage installations or reactor sites beyond the operating license expiration will be subject to licensing and regulatory control to assure that operation of the storage facilities does not result in significant impacts to the public health and safety.

For the reasons discussed previously (Sections 2.4 A through D above), the Commission also concludes, from the record of this proceeding, that storage of spent fuel either at or away from a reactor site for 30 years beyond the operating license expiration would not result in a significant impact to the environment or an adverse effect on the public health and safety. The Commission's findings are also supported by NRC's experience in more than 80 individual safety evaluations of spent fuel storage facilities conducted in recent years. The record indicates that significant releases of radioactivity from spent fuel under licensed storage conditions are highly unlikely. This is primarily attributable to the resistance of the spent fuel to corrosive mechanisms and the absence of any conditions that would result in offsite dispersal of radioactive material. The Commission concludes that the possibility of a major accident or sabotage with off-site radiological consequences at a spent-fuel storage facility is extremely remote because of the characteristics of spent-fuel storage. These include the inherent properties of the spent fuel itself, the benign nature of the water pool or dry storage environment, and the absence of any conditions that would provide a driving force for dispersal of radioactive material. Moreover, there are no significant additional non-radiological consequences which could adversely affect the environment if spent fuel is stored beyond the expiration of operating licenses for reactors. The non-radiological environmental impacts associated with site preparation and construction of storage facilities are, and will continue to be, considered by the NRC at the time applications are received to construct these facilities, which are licensed under NRC's regulations in either 10 CFR Part 50 for reactors or 10 CFR Part 72 for

independent spent fuel storage facilities. The procedure to be followed in implementing the Commission's generic determination is the subject of rulemaking which the Commission is now initiating.

2.5 Fifth Commission Finding

The Commission finds reasonable assurance that safe independent onsite spent fuel storage or offsite spent fuel storage will be made available if such storage capacity is needed.

The technology for independent spent fuel storage facilities as discussed under the fourth Commission Finding, is available and demonstrated. The regulations and licensing procedures are in place. Such facilities can be constructed and licensed within a five-year time interval. Before passage of the Nuclear Waste Policy Act of 1982 the Commission was concerned about who, if anyone, would take responsibility for providing such facilities on a timely basis. While the industry was hoping for a government commitment, the administration had discontinued efforts to provide those storage facilities (Tr. pp. 157-158). The Nuclear Waste Policy Act of 1982 establishes a national policy for providing storage facilities and thus helps to resolve this issue and assure that storage capacity will be available.

Prior to March 1981, the DOE was pursuing a program to provide temporary storage in off-site, or away-from-reactor, storage facilities. The intent of the program was to provide flexibility in the national waste disposal program and an alternative for those utilities unable to expand their own storage capacities (DOE PS p. I-11; DOE CS p. II-66). Consequently, the participants in this proceeding assumed that, prior to the availability of a repository, the Federal government would provide for storage of spent fuel in excess of that which could be stored at reactor sites. Thus, it is not surprising that the record of this proceeding prior to the DOE policy change did not indicate

any direct commitment by the utilities to provide AFR storage. On March 27, 1981 DOE placed in the record a letter to the Commission stating its decision "to discontinue its efforts to provide Federal government-owned or controlled away-from-reactor storage facilities." The primary reasons for the change in policy were cited as new and lower projections of storage requirements and lack of Congressional authority to fully implement the original policy.

The record of this proceeding indicates a general commitment on the part of industry to do whatever is necessary to avoid shutting down reactors or derating them because of filled spent fuel storage pools. While industry's incentive for keeping a reactor in operation no longer applies after expiration of its operating license, utilities possessing spent fuel are required to be licensed and to maintain the fuel in safe storage until removed from the site. Industry's response to the change in DOE's policy on federally-sponsored away-from-reactor (AFR) storage was basically a commitment to do what is required of it, with a plea for a clear unequivocal Federal policy (Tr. pp. 157-159). The Nuclear Waste Policy Act of 1982 has now provided that policy.

The Nuclear Waste Policy Act defines public and private responsibilities for spent fuel storage and provides for a limited amount of federally-supported interim storage capacity. The Act also includes provisions for monitored retrievable storage facilities and for a research, development and demonstration program for dry storage. The Commission believes that these provisions provide added assurance that safe independent onsite or offsite spent fuel storage will be available if needed.

In Subtitle B of the Act, "Interim Storage Program," Congress found that owners and operators of civilian power reactors "have the primary responsibility for providing interim storage of spent nuclear fuel from such reactors" by maximizing the use of existing storage facilities onsite and by

timely additions of new onsite storage capacity. The Federal government is responsible for encouraging and expediting the effective use of existing storage facilities and the addition of new storage capacity as needed. In the event that the operators cannot reasonably provide adequate storage capacity to assure the continued operation of such reactors, the Federal government will assume responsibility for providing interim storage capacity for up to 1900 metric tons of spent fuel (Sec. 131(a)). Such interim storage capacity is to be provided by the use of available capacity at one or more Federal facilities, the acquisition of any modular or mobile storage equipment including spent fuel storage racks, and/or the construction of new storage capacity at any reactor site (Sec. 135(a)(1)).

The Nuclear Waste Policy Act authorizes the Secretary of Energy to enter into contracts with generators or owners of spent fuel to provide for storage capacity in the amount provided in the Act (Sec. 136(a)(1)). However, such contracts may be authorized only if the NRC determines that the reactor owner or operator cannot reasonably provide adequate and timely storage capacity and is pursuing licensed alternatives to the use of Federal storage capacity (Sec. 135(b)).* Further, any spent fuel stored in the "interim storage program" is to be removed from the storage site or facility "as soon as practicable" but in no event later than 3 years following the availability of a repository or monitored retrievable storage facility (Sec. 135(e)). The Act establishes an "Interim Storage Fund" for use in activities related to the development of interim storage facilities, including the transportation of spent fuel and impact assistance to state and local governments (Sec. 136(d)).

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*Accordingly, the Commission has published proposed "Criteria and Procedures for Determining the Adequacy of Available Spent Nuclear Fuel Storage Capacity," 10 CFR Part 53 (48 Fed. Reg. 19382, April 29, 1983).

In addition to providing for interim storage capacity, Congress found that "the long-term storage of high level radioactive waste or spent nuclear fuel in monitored retrievable storage facilities is an option for providing safe and reliable management of such waste or spent fuel." By June 1, 1985, the Secretary of Energy must complete a detailed study of the need for, and feasibility of, such a facility and submit to Congress a proposal for the construction of one or more such facilities. The Act also directs the Secretary of Energy to establish a demonstration program, in cooperation with the private sector, for the dry storage of spent nuclear fuel at reactor sites and provide consultative and technical assistance on a cost-sharing basis to assist utilities lacking interim storage capacity to obtain the construction, authorization and appropriate license from the NRC. Such assistance may include the establishment of a research and development program for the dry storage of no more than 300 metric tons of spent fuel at federally-owned facilities (Sec. 218, (a)(b)(c)).

The Commission's confidence that independent on-site and/or off-site storage capacity for spent fuel will be available as needed is further supported by the strong likelihood that only a portion of the total spent fuel generated will require storage outside of reactor storage basins (DOE PS pp. V-3 to V-13). Estimates of the amount of spent fuel requiring storage away from reactors have declined significantly over the duration of this proceeding (DOE March 27, 1981 letter from O. Brown II, DOE Office of General Counsel, to M. Miller NRC, Presiding Officer in this proceeding).

DOE reported that cumulative spent fuel discharges, previously estimated as 100,000 metric tons of uranium (MTU), dropped to 72,000 MTU through the year 2000. Projected requirements for additional spent fuel storage capacity begin in 1986 (instead of 1981) and increase to 9500 MTU per year by 1997. Earlier projections indicated a need for 16,000 MTU per year for additional

storage capacity in 1997.* DOE pointed out that additional storage requirements could be satisfied in a number of ways, including: (a) use of private existing AFR storage facilities; (b) construction of new water basins at reactor facilities or away from reactor facilities by private industry or the utilities; (c) transshipment of spent fuel between reactors operated by different utilities; (d) disassembly of spent fuel and storage of spent fuel rods in canisters; and (e) dry storage at reactor sites.

Subsequently, DOE published new estimates for additional spent fuel storage capacity ("Spent Fuel Storage Requirements", DOE/RL-82-1, June, 1982). These estimates show a maximum required away-from-reactor (AFR) storage capacity of 8610 metric tons uranium of spent fuel in the year 1997. This is a decline from DOE's previously published planning-base case. The information in Table 1 below is excerpted from DOE/RL-83-1 and provides a range of projections of additional storage capacity needs. The first column is a projection of storage capacity needed over and above the currently existing and planned storage capacity. The second column provides projected values of additional storage capacity needed if maximum re-racking is conducted at existing or planned reactor basin storage pools. The storage capacity needs shown in the second column are somewhat smaller than in the first column. A further decrease in additional needed storage capacity is shown in the third column, which takes into account the possibility of transshipment of fuel from one reactor basin to another basin owned by the same utility. The projected values of needed storage capacity in the first and third columns provide a range of upper and lower bound values, respectively. The most likely outcome

*DOE's planning-base case studies assume maximum basin re-racking at reactors and the maintenance of full-core reserve in reactor basins.

expected by DOE corresponds to the values in the second column. This was formerly known as the planning base case and is now termed the reference case. All projections shown in the table assume the maintenance of a full core reserve. The magnitude of need for additional spent fuel storage capacity projected by DOE has continued to decline, even though DOE has not assumed the use of newly developed technology, such as fuel rod consolidation.

The cumulative amount of spent fuel to be disposed of in the year 2000 is expected to be 58,000 metric tons of uranium [Spent Fuel Storage Requirements (Update of DOE/RL-82-1) DOE/RL-83-1, published January, 1983]. The additional required storage capacity of 13,000 metric tons of uranium projected in the second column for the year 2000 is less than 25% of the total quantity of spent fuel projected to be in storage. It is expected that additional storage will be provided at the reactor site, with some smaller portion to be moved offsite.

Table 1: Additional Cumulative Spent Fuel Storage Requirements, Over and Above Current and Planned Storage at Reactor Storage Basins (Metric Tons of Uranium).*

Year	No Change in current or planned storage capacity	Use Maximum re-racking of current and planned storage capacity	Maximum re-racking plus transshipment
1982	0	0	0
1983	0	0	0
1984	13	13	0
1985	13	13	0
1986	110	110	3
1988	550	490	90
1990	1,500	1,360	310
1995	5,610	5,060	3,000
2000	14,760	13,090	10,370

In response to the Commission's Second Prehearing Memorandum and Order (Nov. 6, 1981) the participants commented on the significance to the proceeding of issues resulting from the DOE policy change on spent fuel storage. The utilities generally limited their written responses to a restatement of the safety of interim storage and an affirmation of the technical and practical feasibility of the alternatives to Federal AFR storage facilities. An implied commitment by industry to implement AFR storage if necessary using one of the several feasible spent fuel storage alternatives is evident from the responses of the utilities, the nuclear industry, and associated groups (i.e., Tr. p. 159).

*Spent Fuel Storage Requirements (Update of DOE/RL-82-1) DOE/RL-83-1, published January, 1983 (not a part of the record of this proceeding).

Based upon the foregoing, the Commission has, then, reasonable assurance that safe independent onsite or offsite spent fuel storage will be available if needed. The technology is demonstrated and the licensing procedures in place. The Nuclear Waste Policy Act establishes a national policy on interim storage of spent fuel and provides for contingency Federal storage capacity to augment that provided by industry. Further, the amount of fuel which may have to be stored in independent spent fuel storage facilities is less than was originally thought.

REFERENCE NOTATION

The following abbreviations have been used for the reference citations in the Appendix:

PS Position Statement

CS Cross-Statement

PHS Pre-Hearing Statement

Tr. Transcript* of January 11, 1982 public meeting with the Commissioners

*The Commission considers this transcript to be part of the administrative record in this rulemaking. However, the transcript has not been reviewed for accuracy by the Commission on the participants, and therefore is only an informal record of the matters discussed.

Participants have been identified by the following citations.

Citation	Participant
AIChE	American Institute of Chemical Engineers
ANS	American Nuclear Society
AEG	Association of Engineering Geologists
AIF	Atomic Industrial Forum, Inc.
Bech	Bechtel National, Inc.
CDC	California Department of Conservation
CEC	California Energy Commission
CPC	Consumers Power Company
Del	State of Delaware
DOE	U.S. Department of Energy
ECNP	Environmental Coalition on Nuclear Power
GE	General Electric Company
Ill	State of Illinois (PS includes Roy affidavit)
Lewis	Marvin I. Lewis
Lochstet	Dr. William A. Lochstet
Minn	State of Minnesota
MAD	Mississippians Against Disposal
NECNP	New England Coalition on Nuclear Pollution
NfE	Neighbors for the Environment (PS includes papers by Dornsife, Rae, and Strahl)
NRDC	Natural Resources Defense Council, Inc.
NY	State of New York
OCTLA	Ocean County and Township of Lower Alloway Creek
Ohio	State of Ohio
SC	State of South Carolina
SE2	Scientists and Engineers for Secure Energy, Connecticut Chapter
SHL	Safe Haven, Ltd.
SMP	Sensible Main Power, Inc.
TVA	Tennessee Valley Authority
UNWMG-EEI	Utility Nuclear Waste Management Group-Edison Electric Institute
USGS	United States Geological Survey
Vt	State of Vermont
Wis	State of Wisconsin (PS includes comments by Deese, Mudrey, Kelly, and Leverance)

(g) *Applications of other regulations.* (1) The term "indefinite employee" as used in the following includes an emergency-indefinite employee: Section 315.601, Part 351, and Subpart G of Part 550 of this chapter.

(2) The selection procedures of part 333 of this chapter apply to emergency-indefinite employees appointed outside the register under paragraph (b) of this section.

(3) Despite the provisions in § 831.201(a)(11) of this chapter, an employee serving under an emergency-indefinite appointment under authority of this section is excluded from retirement coverage, except as provided in paragraph (b) of § 831.201 of this chapter.

(h) *Promotion, demotion, or reassignment.* An agency may promote, demote, or reassign an emergency-indefinite employee to any position for which it is making emergency-indefinite appointments.

[FR Doc. 83-13445 Filed 5-19-83; 8:45 am]
BILLING CODE 6325-01-M

NUCLEAR REGULATORY COMMISSION

10 CFR Parts 50 and 51

Requirements for Licensee Actions Regarding the Disposition of Spent Fuel Upon Expiration of the Reactors' Operating Licenses

AGENCY: Nuclear Regulatory Commission.

ACTION: Proposed rule.

SUMMARY: The Commission has determined, in a separate proceeding known as the "Waste Confidence" rulemaking proceeding that there is reasonable assurance that one or more mined geologic repositories for commercial high-level radioactive waste and spent fuel will be available by 2007–2009. However, the Commission recognizes that there are circumstances under which spent fuel generated prior to that time may remain at reactor sites after the expiration of reactor operating licenses. Some reactor operating licenses will expire or the permanent shutdown of some reactors could occur prior to the 2007–2009 period. Also, since there are not expected to be any safety or environmental problems which would create a need to move fuel offsite, there is some possibility that an election of onsite spent fuel storage after reactor operating license operation may be appropriate. The Commission has considered the safety and environmental impacts of such extended spent fuel storage in the "Waste Confidence" proceeding and for the reasons discussed therein and highlighted below, finds that extended storage for up to 30 years after the expiration of an operating license will result in no significant safety or environmental impacts. The Commission believes there is reasonable assurance that no later than 30 years after the expiration date of the operating license for any commercial power reactor, sufficient repository capacity will have been made available to dispose of all commercial high-level radioactive waste and spent fuel in existence. Thus there is no reasonable probability that spent fuel will unavoidably remain at a reactor site at the end of that 30-year period. Accordingly, the Commission hereby proposes a rule providing that the environmental and safety implications of spent fuel storage after the termination of reactor operating licenses need not be considered further in Commission proceedings for the issuance of an operating license or licensee amendment for a nuclear power plant, despite some probability that such storage may be elected or necessary. The proposed rule also applies to proceedings for licensing spent fuel storage in independent spent fuel storage installations under Part 72, since the same safety and environmental considerations apply as for storage in reactor basins.

The Commission hereby proposes a rule whereby in proceedings for licensing of facilities at which spent fuel will be stored, or proceedings for licensing the expansion of storage capacity at existing facilities, the NRC will continue to require consideration of reasonable foreseeable safety and environmental impacts of spent fuel storage for the period of the license or amendment applied for but will not require consideration of the safety and environmental impacts of storage of spent fuel beyond the expiration of the license or amendment applied for. However, the Commission's proposed rule would require reactor licensees to submit their plans for NRC review and approval 5 years before their operating licenses expire on specifically how spent fuel at these sites will be managed.

Accordingly, the Commission hereby proposes amendments to the Code of Federal Regulations which define procedures to be followed by the licensee to ensure the continued safe management of spent fuel beyond the expiration date of reactor operating licenses and which address the environmental aspects of extended spent fuel storage past the expiration of reactor operating licenses or license for storage in an independent spent fuel storage installation. The amendments are set forth here to complement and complete the Commission findings resulting from the Waste Confidence rulemaking proceeding.

DATES: Comments should be filed with the Commission's Secretary not later than July 5, 1983. Comments received after this date will be considered if it is practicable to do so, but assurance of consideration cannot be given except as to comments received on or before that date.

ADDRESSES: Send comments to: Secretary, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. Attn.: Docketing and Service Branch.

Hand deliver comments to: Room 1121, 1717 H St., N.W., Washington, D.C. between 8:15 a.m. and 5:00 p.m.

Examine comments received at: The NRC Public Document Room, 1717 H St., N.W., Washington, D.C.

FOR FURTHER INFORMATION CONTACT: Dennis Rathbun or Clyde Jupiter, Office of Policy Evaluation, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, telephone (202) 634–3295.

SUPPLEMENTARY INFORMATION:

Background

By a Notice of Proposed Rulemaking dated October 18, 1979, 44 FR 61372 (October 25, 1979), the Nuclear Regulatory Commission ("Commission" or "NRC") began a generic rulemaking proceeding "to reassess its degree of confidence that radioactive wastes produced by nuclear facilities will be safely disposed of, to determine when any such disposal will be available, and whether such wastes can be safely stored until they are safely disposed of." This proceeding became known as the "Waste Confidence" rulemaking proceeding, and was conducted partially in response to a remand by the United States Court of Appeals for the D.C. Circuit. *State of Minnesota* v. *NRC*, 602 F.2d 412 (1979). *State of Minnesota* involved a challenge to license amendments to permit the expansion of spent fuel pool storage capacities at two nuclear powerplants. It was contended that uncertainty regarding ultimate disposal of commercial nuclear wastes required the Commission to consider the safety and environmental implications of storing spent fuel in the pools for an indefinite period following expiration of the plants' operating licenses. The Commission had excluded consideration of such long-term on-site storage from the license amendment proceedings, relying on its earlier finding that safe

permanent disposal of reactor wastes would be available when needed.

The Court of Appeals agreed with the Commission that, in accordance with the "rule of reason" implicit in the National Environmental Policy Act (NEPA), impacts of extended on-side storage of spent fuel need not be considered in licensing proceedings unless such storage was reasonably foreseeable and not merely a theoretical possibility. The Court held, however, that the Commission's statement of reasonable confidence in the timely availability of waste disposal solutions was "not the product of a rulemaking record devoted expressly to considering the question" and furthermore did not address the particular problem whether disposal solutions would be available before the expiration of plant operating licenses. *Id.* at 417. Accordingly, the D.C. Circuit remanded to the Commission for determination "whether there is reasonable assurance that an off-site storage solution will be available by the years 2007–09, the expiration of the plants operating licenses, and if not, whether there is reasonable assurance that the fuel can be stored safely at the site beyond those dates." *Id.* at 418. The Court noted that "the breadth of the questions 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." *Id.* at 417. The Court agreed that the Commission "may proceed in these matters by generic determinations." *Id.* at 419. *Accord, Potomac Alliance* v. *NRC*, 682 F.2d 1030 (D.C. Cir. 1982).

Amendment to Part 51

The Commission announced the conclusions it reached in the Waste Confidence rulemaking proceeding. The Commission found that there is reasonable assurance that one or more mined geologic repositories for commercial high-level radioactive waste and spent fuel will be available by 2007–09. However, some reactor operating licenses may expire without being renewed or some reactors may be permanently shut down prior to this period. Since independent spent fuel storage installations have not yet been extensively developed, there is then a probability that some onsite spent fuel storage after license expiration may be necessary or appropriate. In addition, the Commission also realizes that some spent fuel may be stored in existing or new storage installations for some period beyond 2007–2009. The Commission hereby proposes a rule providing that the environmental and safety implications of such storage after the termination of reactor operating licenses need not be considered in Commission proceedings related to issuance or amendment of a reactor operating license. This rule has the effect of continuing the Commission's practice, employed in the proceedings reviewed in *State of Minnesota*, of limiting considerations of safety and environmental impacts of spent fuel storage in licensing proceedings to the period of the license in question and not requiring the NRC staff or the applicant to address the impacts of extended storage past expiration of the license applied for. The rule relies on the Commission's generic determination in the Waste Confidence proceeding that the licensed storage of spent fuel for 30 years beyond the reactor operating license expiration either at or away from the reactor site is feasible, safe, and would not result in a significant impact on the environment. For the reasons discussed in the Waste Confidence decision, the Commission believes there is reasonable assurance that adequate disposal facilities will become available during this 30-year period. Thus, there is no reasonable probability that storage will be unavoidable past the 30-year period in which the Commission had determined that storage impacts will be insignificant. The same safety and environmental considerations apply to fuel storage installations licensed under Part 72 as for storage in reactor basins. Accordingly, in licensing actions involving (a) the storage of spent fuel in new or existing facilities, or (b) the expansion of storage capacity at existing facilities, the NRC will continue to require consideration of reasonably foreseeable safety and environmental impacts of spent fuel storage only for the period of the license applied for. The amendment to 10 CFR Part 51 confirms that the environmental consequences of spent fuel storage in reactor facility storage pools or independent spent fuel storage installations for the period following expiration of the reactor or facility license or amendment applied for need not be addressed in any environmental report, impact statement, impact assessment, safety analysis report, or other analysis prepared in connection with the reactor operating license or amendment to the operating license, or initial license for an independent spent fuel storage installation, or amendment thereto.

The Commission's conclusions with respect to safety and environmental impacts of extended storage beyond expiration of current operating licenses are supported by the record in NRC's waste confidence proceeding and by NRC's experience in more than 80 individual safety and environmental evaluations conducted in storage licensing proceedings. The record of the Waste Confidence proceeding indicates that significant release of radioactivity from spent fuel under licensed storage conditions is highly unlikely because of the resistance of the spent fuel cladding against corrosive mechanisms and the absence of any conditions that would provide a driving force for dispersal of radioactive material. The non-radiological environmental impacts associated with site preparation and construction of storage facilities are and will continue to be considered by the NRC at the time applications are received to construct these facilities, which are licensed under NRC's regulations in either 10 CFR Part 50 for reactors or 10 CFR Part 72 for independent spent fuel storage installations. There are no significant additional non-radiological consequences which could adversely affect the environment for storage past the expiration of operating licenses at reactors and independent spent fuel storage installations.

The amendment to Part 51 published here consists of two parts: paragraph (e)(1) and paragraph (e)(2). Paragraph (e)(1) is a restatement of a final generic Commission determination based on the Waste Confidence rulemaking proceeding, while paragraph (e)(2) establishes the procedures for implementing that generic determination in individual licensing cases. The Commission requests public comment on paragraph (e)(2).

Amendment to Part 50

The Commission is also proposing an amendment to 10 CFR Part 50 as set forth here, concerning the management of spent fuel from nuclear power reactors whose operating licenses may expire prior to the availability of a repository. The procedures established by this amendment are intended to confirm that there will be adequate lead time for whatever actions may be needed at individual reactor sites to assure that the management of spent fuel following the expiration of the reactor operating license will be accomplished in a safe and environmentally acceptable manner.

The Commission proposes that Part 50, § 50.54 be amended to establish requirements that the licensee for an operating nuclear power reactor shall no later than 5 years prior to expiration of the reactor operating license submit

plans for NRC review and approval of actions which the licensee proposes management of all irradiated fuel at reactor upon expiration of its operating license. No specific course of action is required of the licensee by the NRC. Licensee actions could include, but are not necessarily limited to, continued storage of spent fuel in the reactor spent fuel storage basin; storage in an independent spent fuel storage installation (refer to 10 CFR § 72.3(m)) located at the reactor site or at another site; transshipment to and storage of the fuel at another operating reactor site in that reactor's basin; reprocessing of the fuel if it appears that licensed reprocessing facilities will be available; or disposal of the fuel in a repository. The proposed actions must be consistent with NRC requirements for licensed possession of irradiated or spent fuel (as defined in §72.3(v)) and must be capable of being authorized by the NRC and implemented by the licensee on a timely basis. The licensee's plans must specify how the financial costs of extended storage or other disposition of spent fuel will be funded. Further, the licensee's plans must describe the proposed disposition of all irradiated fuel from the reactor. The licensee shall notify the NRC of any significant changes to these plans; changes are not precluded provided that the licensee maintains the capability to manage the spent fuel safely.

The Commission notes that extended storage of spent fuel at a reactor beyond the expiration date of the operating license will require an amendment to the Part 50 license to cover possession only of the reactor and spent fuel under the requisite provisions of Parts 30, 50 and 70, or an athorization pursuant to Part 72, "Licensing Requirements for the Storage of Spent Fuel in an Independent Spent Fuel Storage Installation" (ISFSI). This rulemaking does not alter the requirements and provisions of Part 72 with respect to environmental considerations (§ 72.20), nor provisions of Part 51 (§ 51.5(a)(10) and §51.5(b)(4)(iv)) with respect to the performance of environmental assessments of the impacts of spent fuel storage in an independent spent fuel storage installation or extended storage in a reactor spent fuel pool. This means that the NRC staff will continue to perform environmental reviews before issuing a license under 10 CFR Part 72 or an amendment for extend storage under CFR Part 50. Notice of the receipt of a use application for storage of spent pursuant to Part 72 will be published in the Federal Register.

Related Commission Actions

On March 13, 1978, an Advance Notice of Proposed Rulemaking was published by NRC in the Federal Register (43 FR 10370) that indicated that the NRC was reevaluating its decommissioning policy and considering amending its regulations to provide more specific guidance on decommissioning of nuclear facilities. In January 1981, NRC published a "Draft Generic Environmental Impact Statement on Decommissioning Nuclear Facilities" (NUREG-0586). Proposed amendments to 10 CFR Parts 30, 40, 50, 70, and 72 are being prepared by the NRC staff for Commission consideration. The proposed amendments for decommissioning would allow unrestricted use of a reactor or independent spent fuel storage installation site and would permit termination of the license. However, the storage of irradiated fuel either in a reactor basin or in an independent spent fuel storage installation would require restricted access and management of the storage facility to protect public health and safety. Thus, any continued storage of spent fuel beyond expiration of an operating license would be licensed under either Parts 50 or 72 and could preclude final decommissioning of the site.

Amendments

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, Section 301 of Public Law 96-295, and Section 553 of Title 5 of the United States Code, notice is hereby given that adoption of the following amendments to Parts 50 and 51 of Title 10, Chapter 1, of the Code of Federal Regulations is contemplated.

The Commission requests public comment on the proposed new paragraph, 10 CFR 50.54(x), to be added to 10 CFR Part 50. The Commission also requests public comment on the proposed new paragraph 10 CFR 51.5(e)(2), to be added to 10 CFR Part 51. The Commission does not request comment on the proposed paragraph, 10 CFR 51.5(e)(1), which restates a conclusion of the Commission's "Waste Confidence" proceeding.

List of Subjects

10 CFR Part 50

Administrative practice and procedure, Antitrust, Classified information, Emergency medical services, Fire prevention, Intergovernmental relations, Nuclear power plants and reactors, Penalty, Radiation protection, Reactor siting criteria, Reporting and recordkeeping requirements.

10 CFR Part 51

Administrative practice and procedure, Environmental impact statement, Nuclear materials, Nuclear power plants and reactors, Reporting and recordkeeping requirements.

PART 50—DOMESTIC LICENSING OF PRODUCTION AND UTILIZATION FACILITIES

1. In § 50.34 immediately following paragraph (w), a new paragraph (x) is added to read as follows:

§ 50.54 Conditions of licenses.

Whether stated therein or not, the following shall be deemed conditions in every license issued.

* * * * *

(x) For operating nuclear power reactors, the licensee shall, no later than 5 year before expiration of the reactor operating license, submit written notification to the Commission for its review and approval of the program by which the licensee intends to manage and provide funding for the management of all irradiated fuel at the reactor upon expiration of the reactor operating license until ultimate disposal of the spent fuel in a repository. The licensee must demonstrate to NRC that the elected actions will be consistent with NRC requirements for licensed possession of irradiated nuclear fuel and that the actions will be implemented on a timely basis. Where implementation of such actions require NRC authorizations, the licensee shall verify in the notification that submittals for such actions have been made to NRC and shall identify them. A copy of the notification shall be retained by the licensee as a record until expiration of the reactor operating license. The licensee shall notify the NRC of any significant changes in the proposed waste management program as described in the initial notification.

PART 51—LICENSING AND REGULATORY POLICY AND PROCEDURES FOR ENVIRONMENTAL PROTECTION

1. The authority citation for Part 51 is revised to read as follows:

Authority: Sec. 161, 68 Stat. 948, as amended (42 U.S.C. 2201); secs. 201, as amended, 202, 88 Stat. 1242 as amended, 1244 (42 U.S.C. 5841, 5842); National Environmental Policy Act of 1969, secs. 102, 104, 105, 83 Stat. 853, 854, as amended (42 U.S.C. 4332, 4334, 4335).

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ROBERT ABRAMS
Attorney General

MARCIA J. CLEVELAND
Assistant Attorney General
In Charge
Environmental Protection Bur

June 23, 1983

Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attn: Docketing and Service Branch

Re: Requirements for Licensee Actions Regarding the Disposition of Spent Fuel Upon Expiration of the Reactors' Operating Licenses; 10 CFR Parts 50 and 51; 48 F.R. 22730 (May 20, 1983)

Dear Sir:

We wish to comment on one aspect of the above-cited proposed rule. The Commission says that it "recognizes that there are circumstances under which spent fuel generated prior to [2007] may remain at reactor sites after the expiration of reactor operating licenses." 48 F.R. 22730, col. 1. The Commission there notes that "[s]ome reactor operating licenses will expire or the permanent shutdown of some reactors could occur prior to the 2007-2009 period," or that a licensee might choose to leave the spent fuel onsite after the reactor has ceased operating. Id. Nonetheless, the Commission "proposes a rule providing that the environmental and safety implication of spent fuel storage after the termination of reactor operating licenses need not be considered further in Commission proceedings for the issuance of an operating license or licensee amendment for a nuclear power plant." Id., col. 2. The Commission says that it will continue to require consideration of safety and environmental impacts of spent-fuel storage "for the period of the license or amendment applied for." Id.

A basic flaw in the proposed rule is that it ignores the mandates of the National Environmental Policy Act ("NEPA"), 42 U.S.C. § 4321, et seq. Ordinarily, NEPA would require the preparation of an environmental impact statement ("EIS") to

consider the impacts of spent-fuel storage onsite beyond the expiration of each particular license or amendment. While the NRC could study the issue generically by preparing a generic draft EIS for public comment, and later a generic final EIS, a generic EIS has not been prepared by the NRC in the Waste Confidence proceeding, or otherwise. Indeed, NRC staff did not even file a position in the proceeding, let alone prepare a detailed EIS.

At no time did the NRC say that its Waste Confidence proceeding would be conducted pursuant to NEPA, or that it would be in fulfillment of NEPA. To the contrary, from the very beginning of the proceeding NEPA was excluded. The Presiding Officer ruled in the Waste Confidence proceeding as follows:

> This rulemaking proceeding does not involve a major federal action having a significant impact on the environment, and consequently an environmental impact statement is not required by NEPA...

First Prehearing Conference Order, dated February 1, 1980, at 10 (footnote omitted). The NRC, therefore, did not comply with the mandates of NEPA, did not prepare a generic EIS, and may not refuse to prepare separate impact statements for each license or amendment.

When the Waste Confidence proceeding was commenced, the Commission said:

> If the Commission finds from this proceeding reasonable assurance that radioactive wastes from nuclear facilities will be safely stored or disposed of off-site prior to the expiration of the license for the facility, it will promulgate a rule providing that the safety and environmental implications of radioactive waste remaining on site after the anticipated expiration of the facility licenses involved need not be considered in individual facility licensing proceedings.

44 F.R. 61373, col. 1 (October 25, 1979) (emphasis added). However, the Commission's finding was precisely the opposite -- that on site storage would be needed after the license period. At no time did the NRC prepare an EIS as to the environmental effects of such post-license storage.

Accordingly, the provision in proposed § 51.5(e) should be withdrawn.

Very truly yours,

Ezra I. Bialik

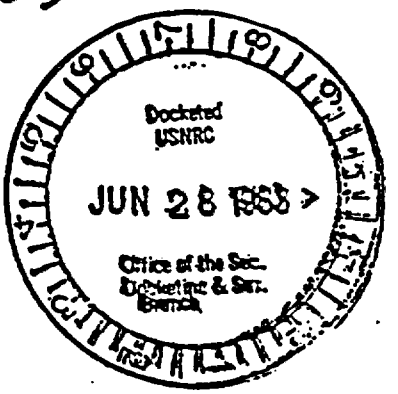
EIB:FC

EZRA I. BIALIK
Assistant Attorney General

DOCKET NUMBER
PROPOSED RULE PR-50,51 (2)
(48 FR 22736)

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION



Requirements for Licensee Actions Regarding the Disposition of Spent Fuel Upon Expiration of the Reactors' Operating Licenses 48 Fed. Reg. 22730 (May 20, 1983)

COMMENTS BY FLORIDIANS UNITED FOR SAFE ENERGY

I Introduction The Nuclear Regulatory Commission (NRC) has proposed rules with respect to spent nuclear fuel remaining on the reactor site after the operating license has expired.

FUSE does not believe that an accumulation of 80 reactor years of spent nuclear fuel can be safely stored on site at Turkey Point for a period of 30 years following the expiration of the licenses for Turkey Point 3 and 4, as the Commission has proposed.

II Case by Case Basis Permission to extend spent fuel storage must come only after a thorough examination of the factors peculiar to Turkey Point and necessary renovations, maintenence contracts and determinations of liability are made.

When Turkey Point was built, the utility, Florida Power and Light, and the vendor, Westinghouse, agreed by contract that the vendor would be responsible for the final disposition of

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spent fuel for the first 10 years of operation. It was assumed that only small spent fuel pits would be necessary due to the expected demand of spent fuel by fuel reprocessors.

As it turned out, nothing was farther from the truth. The vendor breached the contract, reprocessing became an abyssmal failure, disposal fell 45 years behind schedule, and storing the spent fuel has become a dangerous, expensive millstone around the utility's neck.

No assessment of the safety of long term spent fuel storage has ever been made for Turkey Point. A small area for temporary storage became a 40 year facility of spent fuel accumulation and now the Commission has the audacity to suggest that another 30 years, without examining the site, won't hurt anything. The Commission is well advised to rescind this ludicrous proposal.

III Public Service Commission Involvement It is doubtful that the licensee, Florida Power and Light, would be willing to spend any more money on the spent fuel pits at Turkey Point. The plant has a history of leaking spent fuel pits and the licensee has not yet been able to recoup the millions of dollars it has already spent renovating the pits.

The Florida Public Service Commission automatically becomes a partner since issues concerning renovations, maintenence, repairs, and liability have direct economic impact on Florida consumers. FUSE assumes that the Price Anderson Act would not be in effect after the expiration of the license.

IV Leaking Spent Fuel Pits Turkey Point units 3 and 4 have a history of leaking spent fuel pits. The NRC (formerly AEC) has been concerned that leakage rates which exceed makeup water rates could uncover fuel elements resulting in a catastrophic nuclear accident in South Florida. However, the NRC (AEC) has never studied the environmental damage, increased cancers or deaths caused by the leaks of radionuclides from the Turkey Point spent fuel pits. Turkey Point is located on a porous and permeable aquifer and is surrounded by an estuarine area. This estuary serves as a breeding ground for shellfish and foodfish and has been made a National Park to protect those sensitive qualities.

V ASLB Precedent During litigation concerning steam generator repairs at Turkey Point, the Atomic Safety and Licensing Board agreed that the Turkey Point site may be contaminated from 15 years of reactor operation. Before the effects of repair effluents could be determined it would be necessary to know the level of contamination already present at the site. The intervenor was then allowed to carry out a radiological survey of the Turkey Point site.

This precedent holds true for any proposal to extend spent fuel storage for 30 years at a site that may already be lethally contaminated.

FUSE admonishes the Commission for proposing such an ill-planned policy. The NRC may be forced to extend spent fuel storage after license expiration in dire emergencies, but,

all safeguards and precautions must be in place if this decision is to be made. The National Environmental Policy Act of 1969 must be obeyed.

Respectfully submitted,

Mark P. Oncavage, President
Floridians United for
Safe Energy, Inc.
87 Merrick Way
Coral Gables, FL 33134

On this day of:
June 27, 1983
Miami, Florida

Clyde Jupiter

Natural Resources Defense Council, Inc.

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June 30, 1983

Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
ATTN: Docketing and Service Branch

Re: In the Matter of RULEMAKING ON THE STORAGE AND DISPOSAL OF NUCLEAR WASTE (Waste Confidence Rulemaking), PR-50, -51 (44 FR 61372), Draft Decision (May 16, 1983)

Dear Secretary:

The Natural Resources Defense Council, Inc., the New England Coalition on Nuclear Pollution, the Sierra Club, the Environmental Coalition on Nuclear Power, Wisconsin's Environmental Decade, Mississippians Against Disposal, Safe Haven, Ltd., John O'Neill, Jr., and Marvin Lewis ("Consolidated Public Interest Representatives") submit the following comments on the Commission's Draft Decision in the above-captioned Waste Confidence Rulemaking, which was docketed on May 16, 1983. Our comments will be limited to the following two issues:

A) The implications of the Nuclear Waste Policy Act of 1982 for this Commission's Waste Confidence decision;

B) The lack of support in the record for the Commission's finding of reasonable assurance that spent fuel can, if necessary, be stored without significant environmental effects for at least 30 years beyond the expiration of reactor operating licenses.

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New England Office: 16 PRESCOTT STREET • WELLESLEY HILLS, MA. 02181 • 617 237-0472
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A. The Passage of the Nuclear Waste Policy Act of 1982 Is an Insufficient Basis for the Commission's Decision in This Proceeding

The Consolidated Public Interest Representatives agree with Commissioner Ahearne that the record in this proceeding is insufficient to permit a finding of confidence that the radioactive wastes produced by the nation's nuclear power plants can and will be safely disposed of prior to the expiration of current facility licenses, or safely stored at reactor sites until offsite disposal is available. See, e.g. Statements of Position and Joint Cross-Statement of Position of the Natural Resources Defense Council and the New England Coalition on Nuclear Pollution. The Commission now states that passage of the Nuclear Waste Policy Act of 1982 (Pub. L. 97-425) had a significant bearing on the Commission's decision, particularly in narrowing the uncertainties surrounding institutional issues. Chairman Palladino stated that the NWPA was important for the Commission's finding on the timing of the availability of the waste disposal repository, and Chairman Ahearne stated that the NWPA was the major factor in the Commission's finding of confidence. The Consolidated Public Interest Representatives believe that, for reasons stated below, the NWPA does not provide a sufficient basis, either alone or when considered alone with the record, for a finding of confidence regarding either the availability or timing of a nuclear waste disposal regime.

First, as Commissioner Ahearne noted, the NWPA contains many areas of ambiguity, largely as a result of a hasty, last-minute

compromise to secure passage in the closing days of the Congressional session. One glaring example surfaced recently during a briefing held by DOE officials for the Commission staff. Section 114(a) of the NWPA requires DOE to make a recommendation to the President for the first repository site, accompanied by the preliminary comments by the Commission concerning the suitability of 3 alternative candidate sites for licensing under 10 CFR Part 60. DOE interprets this section to require such preliminary comments before site characterization begins; thus, if characterization work reveals that a site could not be licensed under 10 CFR Part 60, DOE could still include the site as a "good faith alternative" when recommending the first site. The Commission staff interprets that section and its legislative history to require a judgment of suitability under 10 CFR Part 60 after site characterization has occured; thus, if site characterization reveals a fatal flaw, the site must be abandoned and the process begun anew at a new site, thus yielding three acceptable sites for consideration by the President. The timing difference in these two interpretations is potentially enormous.

Another ambiguity has arisen concerning the grandfathering of the Hanford site from various requirements in the NWPA. DOE originally interpreted Section 112(f) to permit continuation of ongoing site characterization at Hanford before completion of the DOE siting guidelines. DOE now concedes that such site characterization work must await completion of an environmental

assessment prepared in accordance with final DOE siting guidelines. Other ambiguities will undoubtedly arise as the site selection process is carried out.

Second, as Commissioner Ahearne noted, the dates specified in the NWPA by no means provide assurance that they will be met, since, historically, Congressional deadlines have often been missed. We need not look too far for examples, since DOE has already missed the first deadline set out in the Act for promulgation of site selection guidelines under Section 112. DOE issued draft guidelines in February, 1983, hoping to promulgate final guidelines by the June, 1983 deadline, but due to the sheer volume of public comment, will be unable to complete a final version until this fall. DOE is now in the difficult position of having to choose between missing the deadlines or failing to carry out its responsibilities for full consultation and cooperation with States, affected Indian tribes, and members of the public. We agree with DOE that the inherent tensions in the NWPA should be resolved in favor of an adequate consultation process, but the resultant delays make the NWPA a slender basis for the finding of timely repository development.

Other provisions of the NWPA also support the conclusion that the date for the availability of a repository is far from certain. Neither the President nor the NRC are bound to approve recommended sites; each is granted explicit authority to reject any or all site proposals. §§ 112(c), 114(d). This authority would presumably be exercised, for example, if technical problems

remained unsolved or significant health and safety risks persisted. Furthermore, the legislation expressly contemplates the possibility of delay beyond the statutory deadlines. § 114(e)(2). Finally, the legislative history supports our position that the timing of repository availability is tenuous at best. See, e.g., 128 Cong. Rec. H8583 (daily ed. Nov. 30, 1982) (Rep. Lujan); id. at H8584 (Rep. Corcoran); id. (Rep. Broyhill).

Third, the NWPA has by no means significantly reduced the institutional uncertainties regarding participation and objections of affected States and Indian tribes. Since passage of the Act, State officials and Indian tribes have raised numerous concerns regarding inadequate time to monitor and comment upon various agency proposals, lack of agency response to State and Indian concerns, and inadequate funding by DOE to enable full participation. These concerns are strikingly similar to the ones raised before passage of the NWPA. Even more significantly, Section 115 of the NWPA provides States and affected Indian tribes with a new, strong authority to veto siting of a repository within their borders, thus increasing the institutional uncertainty surrounding timely repository development.

Finally, the NWPA does not purport to resolve the substantial technical uncertainties that exist concerning repository development and safety, or to in any way "solve the waste problem." The "McClure Amendment" to S. 1662, § 204, for example, declared that the law "shall be construed...to satisfy

any legal or statutory requirement...for assurance of the safe disposal of spent fuel and high-level nuclear waste and the scheduled availability of storage and disposal facilities." One version of the House bill which was not passed, H.R. 6598, § 111(b)(5), also expressed a purpose to provide "reasonable assurance" that safe waste disposal methods will be available when needed. Although the House Report indicates a concern about avoiding an overly broad interpretation of this provision that would preempt state and federal laws, judicial decisions, and administrative proceedings, such as the Waste Confidence proceeding, it also states that "the program established in this Act will provide such assurance" of safe waste disposal methodologies. See H.R. Rep. No. 785, 97th Cong., 2d Sess. 49-50, 60 (1982). Even this watered-down provision was excised from the House bill that was approved in early December, H.R. 3809. According to Rep. Ottinger, these and similar provisions were intentionally deleted "to insure that there be no preemption" of state and federal laws, judicial decisions, or administrative proceedings. 128 Cong. Rec. H8797 (daily ed. Dec 2, 1982). See also id. at S6406 (daily ed. May 27, 1982) (Sen. Hart). This legislative history demonstrates that Congress considered, but purposefully rejected, the possibility of resolving by legislative fiat the issues at stake in the "Waste Confidence" proceeding.

B. There Is No Support in the Rulemaking Record for the Commission's Finding that Extended Spent Fuel Storage for Up to 30 Years After the Expiration of an Operating License Will Result in No Significant Environment Impacts.

The Commission correctly noted that its discussion of the safety of dry storage of spent nuclear fuel relies substantially on material not in the record. The Consolidated Public Interest Representatives note another major finding that is similarly based on material not in the record, (nor anywhere for that matter), and that has already formed the basis for a subsequent proposed rulemaking. That is the portion of the Commission's fourth finding which states:

> The Commission finds reasonable assurance that, if necessary, spent fuel can be stored...without significant environmental effects for at least 30 years beyond the expiration of reactor operating licenses....

(Slip op. at 6) (emphasis added). The Commission has recently proposed to codify this finding in an amendment to 10 CFR Part 51, but explicitly requests no public comment on this amendment. Requirements for Licensee Actions Regarding the Disposition of Spent Fuel Upon Expiration of the Reactor's Operating Licenses, 48 Fed. Reg. 22730, 22732 (May 20, 1983). Based on this finding of no significant environmental impacts for 30 years of extended spent fuel storage, (as well as its findings that sufficient repository capacity will be available after that time period) the proposed rule goes on to state:

> Accordingly, the environmental consequences of spent fuel storage in reactor facility storage pools or independent spent fuel storage installations for the period following

> expiration of the reactor or storage installation license applied for need not be addressed in any environmental report, impact statement, impact assessment, safety analysis report, or other analysis prepared in connection with a reactor operating license or amendment to the operating license or initial license for an independent spent fuel storage installation, or amendment thereto.

49 Fed. Reg. at 22733 (emphasis added). Because the Commission has expressly declined comment on the finding of 'no significant environmental impact' which forms the basis for this sweeping rule, the Consolidated Public Interest Representatives have no opportunity to comment on this finding other than in the context of the Waste Confidence Rulemaking itself. As shown below, this finding has no support in the record, and should not serve as a justification for excluding consideration in reactor licensing actions of the environmental impacts of extended spent fuel storage.

The Waste Confidence proceeding was conducted in response to a remand by the United States Court of Appeals for the D.C. Circuit in State of Minnesota v. Nuclear Regulatory Commission, 602 F.2d 412 (D.C. Cir. 1979), for a determination

> whether there is reasonable assurance that an off-site storage solution will be available by the years 2007-09, the expiration of the plants' operating licenses, and if not, whether there is reasonable assurance that the fuel can be stored safely at the site beyond these dates.

Id. at 418. Thus, the purpose of the remand was to determine the timing and safety of waste storage and disposal, not their environmental impacts. The Commission echoed these themes in its

Notice of Proposed Rulemaking initiating the Waste Confidence rulemaking, which stated that its purpose was

> 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.

44 Fed. Reg. 61373.

In the First Prehearing Conference Order in the Waste Confidence Proceeding (February 1, 1980), the presiding officer ruled sua sponte that "[t]his rulemaking proceeding does not involve a major federal action having a significant impact on the environment, and consequently an environmental impact statement is not required by NEPA." Id. at 10. Although the Natural Resources Defense Council wrote to the presiding officer expressing "shock" that the NEPA issue had been ruled upon on the basis of a superficial colloquy, without the assistance of briefing or legal analysis, (letter from Ronald J. Wilson, Esq. to Hon. Marshall E. Miller, dated Feb. 14, 1980), the ruling went unchanged.

As a result of those statements of purpose, members of the public commented on the narrow issue of whether and when wastes could be safely disposed of and did not address the environmental consequences of indefinite storage, although many public commenters have long been deeply involved in such issues and undoubtedly would have addressed them had they been identified as

aspects of the rulemaking proceeding. See, e.g., Statement of Position of the Natural Resources Defense Council and the New England Coalition on Nuclear Pollution. Consequently, the record in the Waste Confidence proceeding is simply bereft of discussion or references to the environmental impacts of extended onsite or offsite spent fuel storage for any period of time following expiration of reactor operating licenses. The evaluation of the radiological implications of such storage cannot serve as a substitute for full evaluation under NEPA of all environmental impacts, including nonradiological impacts.

In fact, these effects have not been evaluated in any generic or site-specific environmental impact statement or licensing action to date. The Department of Energy's Final Environmental Impact Statement on Management of Commercially Generated Radioactive Waste, DOE/EIS-0046F (October 1980), concerns primarily the environmental impacts of development of conventionally mined deep geologic repositories, although it considers general alternatives, including a no-action alternative involving onsite or offsite storage. Yet even in the no-action alternative, "existing storage is known to be temporary and no consideration has been given to the need for additional temporary storage when facilities in use have exceeded their design lifetimes." DOE/EIS-0046F at 1.21. Thus, DOE has not evaluated the environmental impacts of storing spent fuel onsite or offsite after expiration of an existing reactor's operating license.

Similarly, the Commission's Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel, NUREG-0575, Project No. M-4 (August, 1979), does examine the potential environmental impacts of interim spent fuel storage. This GEIS, however, draws another arbitrary line and fails to examine environmental impacts of spent fuel storage beyond the year 2000:

> The storage of spent fuel addressed in this generic environmental impact statement is considered to be an interim action, not a final solution....The Commission announcement of September 16, 1975 outlining this study stipulated that the Staff was to examine the period through the mid-1980's. In the absence of a national policy directed to final disposition of spent fuel, the staff extended the time period of this study to year 2000. This extension provided a conservative upper bound to the interim spent fuel storage situation at a date that constituted a practical limit to the forecasting that may logically be used as a basis for today's decisionmaking.

NUREG-0575, Vol. 1, p. ES-1. Therefore, this GEIS also fails to examine the environmental impacts of spent fuel storage for any period following expiration of existing nuclear reactor operating licenses, which is assumed to be the years 2007-2009.

Finally, the Commission, in its May 20, 1983 proposed rule, stated that its conclusions with regard to environmental impacts of extended storage beyond expiration of current operating licenses are supported by "NRC's experience in more than 80 individual safety and environmental evaluations conducted in storage licensing proceedings." 48 Fed. Reg. 22731. Yet, once again, the environmental reviews in these proceedings have

consistently been limited to the time period of the license applied for. 44 Fed. Reg. 61373, 48 Fed. Reg. 22730.

The Commission now admits that "there is...a probability that some onsite spent fuel storage after license expiration may be necessary or appropriate," and that "some spent fuel may be stored in existing or new storage installations for some period beyond 2007-09." 48 Fed. Reg. 22731. The Commission has also left open the possibility that spent fuel might be stored on or offsite even after the 30 year period following license expiration. 44 Fed. Reg. 22731. The Commission apparently does not dispute that, given these probabilities, it must examine the environmental consequences of such storage. Yet, as shown above, there has been absolutely no generic or site-specific EIS evaluation of these consequences in the Waste Confidence proceeding or elsewhere. Nor has there been a Negative Declaration accompanied by an Environmental Impact Appraisal, as required by 10 CFR Part 51. Such a Negative Declaration would be necessary to back up the Commission's proposed ruling that the impacts of extended fuel storage are so insignificant that they need not be mentioned in any site-specific environmental impact statement for a reactor operating license, spent fuel storage installation license, or amendments thereto. These unsupported findings fail to comply with NEPA, which requires consideration in an impact statement of all reasonably foreseeable environmental impacts, and requires an agency to allow all significant environmental risks to be factored into the decision whether to

undertake a proposed action. Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 538-39 (1978); Baltimore Gas & Electric Co. v. NRDC, 51 U.S.L.W. 4678, 4681 (U.S. June 6, 1983).

The Commission cannot point to other proceedings and documents as a justification for excluding discussion of extended spent fuel storage environmental impacts, when those other proceedings and documents also exclude discussion of these impacts. The Consolidated Public Interest Representatives hereby request the Commission to withdraw its finding on the environmental impacts of extended fuel storage beyond license expiration, and promulgate a rule requiring that these impacts must be considered in all proceedings for the issuance of a new license for a nuclear reactor, a new reactor-site storage facility, or a new off-site storage facility.

Respectfully submitted,

Barbara A. Finamore

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(3)

DOCKET NUMBER
PROPOSED RULE PR-50 51
(48 FR 22730)

TOLEDO EDISON

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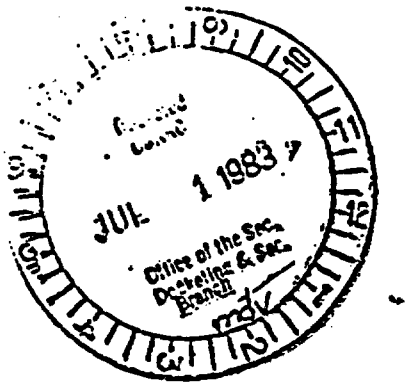
June 29, 1983



Secretary
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

ATTN: Docketing and Service Branch

RE: Requirements for Licensee Actions Regarding the Disposition of Spent Fuel Upon Expiration of the Reactors' Operating Licenses

Dear Sir:

This letter provides you with The Toledo Edison Company's comments on the Commission's proposed rule establishing requirements for licensee actions regarding the disposition of spent fuel upon expiration of reactor operating licenses (48 Fed. Reg. 22,730 (1983)). The Toledo Edison Company is the operating company for Davis-Besse Nuclear Power Station Unit No. 1, and is part owner, as a tenant in common, of Davis-Besse Nuclear Power Station Unit No. 1, Beaver Valley Power Station Unit 2 and Perry Nuclear Power Plant Units 1 and 2.

We have reviewed a draft of comments on the proposed rule prepared by the Utility Nuclear Waste Management Group (UNWMG) and the Edison Electric Institute (EEI). The Toledo Edison Company endorses all of these comments, and will not repeat them all here. In particular, we strongly agree with the comments on the "approval" requirement five years prior to operating license expiration. Existing licensing procedures are adequate to ensure safe management of spent fuel.

We urge that the Commission issue a final rule promptly. If we can provide any additional input to you, please let us know.

Very truly yours,

RPC/JWK/llh

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Acknowledged by card 7/6/83 mdv.

DOCKET NUMBER
PROPOSED RULE PR-50,51 (4)
(48 FR 22730)

Environmental Policy Institute
317 Pennsylvania Ave. S.E. Washington, D.C. 20003
202/544-2600

July 5, 1983

Secretary
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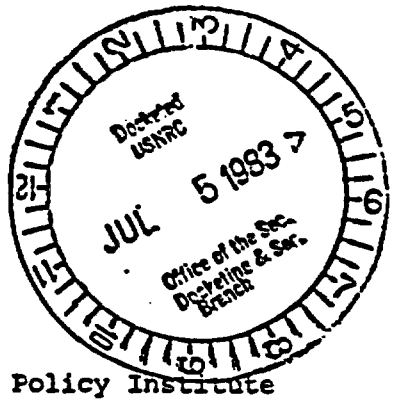
Attention: Docketing & Services Branch



Dear Sir,

Attached are the comments of the Environmental Policy Institute concerning the Commission's proposed changes to 10 CFR Parts 50 and 51 "Requirements for Licensee Actions Regarding the Disposition of Spent Fuel Upon Expiration of the Reactors' Operating Licenses." These comments are made pursuant to the Commission's Federal Register Notice published May 20, 1983(48 FR 22730).

Respectfully submitted,

David Berick
Director, Nuclear Waste Project

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Acknowledged by card. 7/6/83 mdv

Comments of the Environmental Policy Institute
in the Matter of:

10 CFR Parts 50 and 51
Requirements for Licensee Actions
Regarding the Disposition of Spent
Fuel Upon Expiration of the Reactors'
Operating Licenses

The Environmental Policy Institute makes the following comments concerning the Commission proposed rule regarding the disposition of spent fuel upon expiration of reactors' operating licenses pursuant to the Commission's Federal Register Notice published May 20, 1983(48 FR 22730):

The Commission proposes to make a generic finding whereby it will not require consideration of the safety and environmental impacts of storage of spent fuel beyond the expiration of a power reactor operating license or an amendment. The Commission argues that there is reasonable assurance that no later than 30 years after the expiration date of such licenses permanent disposal capacity will be available for spent fuel generated by those reactors. The Commission bases its finding on the record and findings made in the "Waste Confidence Proceeding" conducted by the Commission.

We do not believe that the Commission's proposal adequately addresses the actual record of its licensees in managing spent fuel nor in operating reactors. Specifically, several licensed reactors have terminated operation well in advance of the 30 year licensed period. Of the first generation commercial plants, Dresden 1 ceased operation nineteen years after operating license(OL)issuance. Indian Point 1 ceased operation 12 1/2 years after OL issuance. Humboldt Bay ceased operation 14 years after OL issuance.

The failure of utilities to develop adequate spent fuel storage facilities in a timely manner resulted in the incorporation of a specific national spent fuel management policy in the Nuclear Waste Policy Act including direction to the Commission to expedite the licensing of on-site storage and to encourage the development of additional on-site storage capacity. The failure of Commission licensees to develop timely storage capacity also resulted in a persistent state of crisis and calls for the creation of a federal program for spent fuel storage. A program for emergency spent fuel storage capability by the Federal Government was incorporated in Subtitle B of the Title I of the Nuclear Waste Policy Act as a result.

In short, spent fuel storage can be seen to present an immediate management problem as well as a problem at the time of termination of operating licenses. The record shows that contrary to "generic" view taken by the Commission termination of an operating license may occur within a two decades of issuance based on the history of Commission licensees through normal

operation. This reflects a period of time several times less than the 60 years of operation and storage envisioned by the Commission(30 year OL period and 30 year "reasonable assurance" period for ultimate disposal).

We also believe that the Commission's proposal will create an artificial distinction between decommissioning/decontamination and spent fuel disposition. It is premature to require a separate spent fuel disposition policy when the Commission has not fully considered the issue of OL termination and decommissioning including spent fuel maintenance requirements, utilization of spent fuel storage capacity for decommissioning, etc,

Faced with this record and the need to consider OL termination due to accidents such as Three Mile Island or Fermi 1, it is difficult to envision either policy or management rationale for making a generic determination that licensees need not address long-term spent fuel management issues. Requiring development of a spent fuel management plan at a point in time five years before expiration of an OL appears entirely inadequate in light of licensee experience and arbitrary. It will not assure timely notice to the Commission nor timely action by the licensee in the event(as in the cases cited above)that the OL will terminate prior to the original 30 year period of the license. Similarly, it provides an entirely artificial picture of individual and industry-wide spent fuel storage requirements. The Commission's implication that "Some reactor operating licenses will expire or the permanent shutdown could occur prior to the 2007-2009 period" is a gross understatement. A quick review of OL issuance dates shows that 63 reactors will reach the 30 year operation period prior to the 2007 date. Some will reach the end of the 30 year OL period as early as 1992(Big Rock Point, Dresden 1).

While we believe that the Commission is overly optimistic in its belief that sufficient disposal capacity can be made available in a "timely manner", we wish to point to specific requirements in the Nuclear Waste Policy Act which will determine the use of such capacity as is available. The Commission, in light of these provisions, may not assume, as it has, that plants will gain access to repository capacity coincident with their termination of OL or reflecting the timing of that termination.

Specifically, the President is required to make a finding as to whether or not defense wastes will be commingled and/or disposed of in commercial waste repositories(Section 8 of the Nuclear Waste Policy Act). This section carries the presumption that defense waste will be disposed of in commercial repositories. In fact, the DOE has issued a Notice of Intent to prepare an environmental impact statement for management of defense waste at its Hanford Reservation which states that disposal in a commercial repository is the preferred option(48 FR 14029, April 1, 1983). Such a determination could result in the the utilization of significant amount of repository capacity.

Current plans for waste solidification at the Savannah River Plant alone project production of 10,000 cannisters of HLW (a DOE estimated equivalent of one-seventh of commercial HLW produced through 2040 by a 250 GWe-Nuclear-Year-2000 scenario) (DOE/EIS-0082, February 1982).

We also note the requirements of Subtitle B of Title I of the Nuclear Waste Policy Act which requires maximization of on-site storage and authorizes a federal spent fuel storage program. Section 135(e) establishes a statutory requirement that spent fuel stored under the federal spent fuel storage program must be moved from interim storage within 3 years of the availability of permanent diposal or storage facilities thereby giving priority to this source of spent fuel. Priority of disposal is also established under the Department of Energy disposal contracts under Section 302 of the Nuclear Waste Policy Act. The Department has published these contracts(48 FR 16590, April 18, 1983). Although DOE proposes to give priority to the oldest fuel, it is not clear how this will be handled on a plant by plant basis and DOE does not intend to issue specific acceptance priorities until April, 1992 and thereafter on an annual basis.

In summary, the operation of individual plants and the vagaries of the federal high-level waste repository system indicate that the generic determination proposed by the Commission as to the non-consequence of continued long-term storage does not apply on an individual plant basis. Plants are far more likely to have need to dispose of spent fuel prior to the 30 year operating life than the Commission indicates. They are also far more likely, in our view, to exceed the 30 year period <u>after termination</u> of operation than the Commission indicates. In either event, the Commission's generic determination that a 30 year post-operation storage period is of no safety or environmental consequence does not, in our view, adequately reflect the consequences for individual plant operation and decommissioning nor the larger issue of national spent fuel management and nuclear waste policy.

In view of the Commission's own determination in the Waste Confidence Proceeding that it should review its conclusions on waste confidence at least every 5 years("Future Actions by the Commission"), we similarly believe that utilities should be required to also perform a five year evaluation of spent fuel management requirements. Such a requirement is not only in keeping with the intent of Subtitle B of Title I of the Nuclear Waste Policy Act of encouraging on-site storage and innovative approaches to spent fuel management, but such action is required of the Commission by Section 132. Consequently, we believe that the Commission should not violate the intent of Subtitle B by excusing utilities from considering the consequences of long-term storage of spent fuel by making the proposed generic determination, but rather should require utilities to prepare five year spent fuel management plans. Such plans would also provide a basis for the Commission to determine "adequacy" and "diligence" under Section 135 of the Nuclear Waste Policy Act

contrary to the procedures now proposed by the Commission(Proposed 10 CFR Part 53, 48 FR 19382, April 29, 1983).

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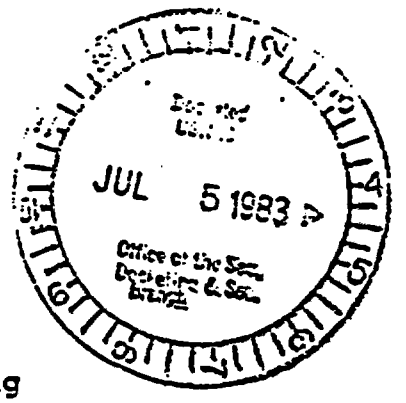
DOCKET NUMBER
PROPOSED RULE PR-50,51
(48 FR 22730)

July 5, 1983



Mr. Samuel J. Chilk
Secretary
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Attention: Docketing and Service Branch

RE: Proposed Regulations Prescribing Requirements for Licensee Actions Regarding the Disposition of Spent Fuel Upon Expiration of the Reactors' Operating Licenses, 48 Fed. Reg. 22730 (May 20, 1983)

Dear Mr. Chilk:

On May 20, 1983, the Nuclear Regulatory Commission published in the Federal Register proposed regulations regarding the long-term storage of spent nuclear fuel after the expiration of an operating license. 48 Fed. Reg. 22730. The proposed regulations are designed to implement the NRC's determination in the "Waste Confidence" rulemaking proceeding that the storage of spent fuel for up to 30 years after the expiration of an operating license will create no significant environmental problems. The Commission invited comments on the proposed regulations to be filed by July 5, 1983.

On behalf of the Utility Decommissioning Group,[1] we submit the following comments on the proposed regulations. The Utility Decommissioning Group consists principally of utilities which are

[1] The Group consists of the Edison Electric Institute and the following 16 nuclear utilities: Arkansas Power & Light Company, Carolina Power & Light Company, Dallas Power & Light Company, Duke Power Company, Jersey Central Power & Light Company, Metropolitan Edison Company, Northeast Utilities Service Company, Pacific Gas & Electric Company, Pennsylvania Electric Company, South Carolina Electric & Gas Company, Southern California Edison Company, Texas Electric Services Company, Texas Power & Light Company, Texas Utilities Generating Company, Virginia Electric & Power Company and Yankee Atomic Electric Company.

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Acknowledged by card. 7/6/83. mdv

holders of NRC licenses to construct and/or operate nuclear power reactors. The Group was formed in 1977 to participate in the NRC rulemaking on decommissioning. 42 Fed. Reg. 40063 (August 8, 1977); 43 Fed. Reg. 10370 (March 13, 1978).

The proposed regulations consist of three provisions. The first (10 C.F.R. §51.5(e)(1)) would codify three generic determinations made by the Commission in the current Waste Confidence rulemaking proceeding, viz., (1) that "no significant environmental impacts" will result from storage of spent fuel for up to 30 years after expiration of an operating license, (2) that "there is reasonable assurance" that one or more geologic repositories for spent fuel and high-level radioactive waste will be available by the years 2007-09, and (3) "that sufficient repository capacity will be available within 30 years beyond expiration of a reactor operating license to dispose of high-level radioactive waste and spent fuel originating in such reactor and generated up to that time." 48 Fed. Reg. at 22733. Support for these Commission determinations is found in the record of the Waste Confidence proceeding and is provided "by NRC's experience in more than 80 individual safety and environmental evaluations conducted in storage licensing proceedings." 48 Fed. Reg. at 22731.

The second proposed addition to the Commission's regulations (10 C.F.R. §51.5(e)(2)), would establish the procedures for implementing the above noted generic determinations in individual licensing cases. Id. This proposed section provides that "the environmental consequences of spent fuel storage in reactor facility storage pools or independent spent fuel storage installations" following expiration of a license need not be addressed in environmental or safety reports, or other analyses prepared in connection with a reactor operating license or amendment. 48 Fed. Reg. at 22733.

The third proposed addition to the Commission's regulations (10 C.F.R. §50.54(x)) would require that five years before the expiration of an operating license, the licensee shall "submit written notification to the Commission for its review and approval of the program by which the licensee intends to manage and provide funding for the management of all irradiated fuel at the reactor... until ultimate disposal of the spent fuel in a repository." 48 Fed. Reg. at 22732. The Commission does not attempt to limit, or in any way influence, the licensee's decision with regard to its course of action concerning storage of spent fuel.[2] However, the NRC states that the action

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[2] The Commission states that storage options include, but are not limited to, "continued storage of spent fuel in the reactor's spent fuel storage basin; storage in an independent spent fuel storage installation (refer to 10 C.F.R. §72.3(m)) located at the reactor site or at another site; transshipment to and storage of

(footnote continued)

selected must comply with all NRC requirements for licensed possession of irradiated or spent fuel (as defined in 10 C.F.R. §72.3(v)) and must be "capable of being authorized by the NRC and implemented by the licensee on a timely basis." 48 Fed. Reg. at 22732. Further the Commission states that the plans must specify how the financial costs of extended storage or other disposition of spent fuel will be funded. Id.

COMMENTS

Our comments will be limited to those portions of the proposed regulations that are directly related to decommissioning, namely the requirements of proposed 10 C.F.R. §50.54(x). We will not address the merits of the Commission's proposed 10 C.F.R. §51.5(e)(1) and (2) which implements the environmental determinations of the Waste Confidence proceedings.

Proposed 10 C.F.R §50.54(x) is designed to establish requirements pertaining to the management and funding of spent fuel storage after the expiration of the operating license. It is our position that the Commission should not attempt to prescribe such requirements on the basis of the record before it in this proceeding. The subject of spent fuel management is an integral part of and should be addressed in the current decommissioning rulemaking. We therefore recommend that the Commission withhold promulgation of this regulation now, but rather consolidate it with its consideration of decommissioning planning. However, in the event that the Commission decides to proceed separately with spent fuel management planning, we urge that several modifications to proposed 10 C.F.R. §50.54(x) be made.

1. The Commission's Consideration of Spent Fuel Management Plans Should be Consolidated With the Decommissioning Rulemaking.

In the proposed regulation the Commission acknowledges that the management of spent fuel beyond expiration of an operating license is a subject directly related to its current reevaluation

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(footnote continued from previous page)
the fuel at another operating reactor site in that reactor's basin; reprocessing of the fuel if it appears that licensed reprocessing facilities will be available; or disposal of the fuel in a repository." 48 Fed. Reg. at 22732.

of decommissioning policy. 48 Fed. Reg. at 22732. As the Commission observes (id.):

> The proposed amendments for decommissioning would allow unrestricted use of a reactor or independent spent fuel storage installation site and would permit termination of the license. However, the storage of irradiated fuel either in a reactor basin or in an independent spent fuel storage installation would require restricted access and management of the storage facility to protect public health and safety. Thus, any continued storage of spent fuel beyond expiration of an operating license would be licensed under either Parts 50 or 72 and could preclude final decommissioning of the site.

Given the interrelationship between spent fuel storage and decommissioning, it is evident that the two subjects should be addressed together. In the first place, we believe that coordinated planning in this area is essential. The considerations that are important to the formulation of decommissioning plans are also important for purposes of spent fuel management plans under proposed 10 C.F.R. §50.54(x).

The Commission's determination that extended on-site storage of spent fuel following expiration of the operating license is safe and environmentally acceptable suggests that mothballing may be the preferred decommissioning mode for those projects where extended storage is likely.[3] The Commission appears to recognize that the on-site storage of spent fuel for up to 30 years after expiration of the license would not add appreciably to the cost,

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[3] See Reg. Guide 1.86: "Mothballing of a nuclear reactor facility consists of putting the facility in a state of protective storage." Mothballing is equivalent to the SAFSTOR mode of decommissioning which is defined in the Draft Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, NUREG-0586, issued January 1981, at 2-7, as "those activities required to place (preparation for safe storage) and maintain (safe storage) a radioactive facility in such condition that the risk to safety is within acceptable bounds, and that the facility can be safely stored and subsequently decontaminated to levels which permit release of the facility for unrestricted use (deferred decontamination)."

the land use effects, and the socioeconomic consequences of the mothballing mode of decommissioning over a similar period of time.[4]

It is this sort of interrelationship between spent fuel storage and decommissioning that should compel the Commission to consider the two subjects in one proceeding. In this connection, the question of funding extended spent fuel management is a subject that would be more appropriately considered in the decommissioning rulemaking. In our opinion, there is no justification for requiring separate review of a licensee's financing plan for spent fuel management, as proposed 10 C.F.R. §50.54(x) would do. Instead, the funding issue should be considered as part of the broader subject of financing decommissioning costs. Questions concerning the appropriate method of funding decommissioning costs, the degree of assurance required, and the need for prefunding have been extensively considered in the decommissioning rulemaking. Inasmuch as the cost of managing spent fuel pools should represent only a minor portion of the total cost associated with decommissioning, it would be appropriate for the Commission to consolidate the funding issue with the decommissioning proceedings.

Further, the record developed in the decommissioning rulemaking can provide additional support for the Commission's determination concerning the non-radiological effects of extended on-site storage. The Draft Environmental Impact Statement for Decommissioning addresses in detail many environmental consequences of the decommissioning alternatives which are relevant to the planning and management of extended spent fuel storage.[5]

Our basic concern here is that the Commission should not try to establish requirements for spent fuel management and decommissioning separately. The Commission should strive to develop a system of coordinated planning for the management of a reactor site for the period following the expiration of an operating license. The requirements for such planning could be based on the records of the Waste Confidence and decommissioning rulemakings. Ultimately the Commission could require the filing of a single coordinated plan embracing all the features of the proposed spent fuel management plan and the decommissioning plan.

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[4] The Commission should consider both off-site and on-site storage as part of the decommissioning rulemaking. We recognize that off-site spent fuel storage may not be as closely linked to decommissioning as on-site storage. However, in view of the funding question, the need for coordinated planning and the lack of urgency to issue the regulations proposed, we believe the Commission should consider off-site spent fuel management in the decommissioning context.

[5] See DGEIS, NUREG-0586, at 4-9 to 4-12, and 5-9 to 5-12.

However, there is no need for the Commission to act hastily and in piecemeal fashion in this regard since no power reactors are scheduled for decommissioning prior to the expected issuance of the decommissioning rules. Rather, the better course as a matter of regulatory policy is for the Commission to consider spent fuel management in the broader context of the decommissioning rulemaking.

2. In the Event that the Commission Chooses Not To Consolidate Spent Fuel Management Planning with the Decommissioning Rulemaking, Several Changes Should Be Made in Proposed 10 C.F.R. §50.54(x).

There are several features of the proposed regulation that would create problems for decommissioning planning. We urge the Commission, in the event that it does not consolidate consideration of spent fuel management with the decommissioning rulemaking, to modify or clarify these problem areas.

a. Funding Spent Fuel Management

Proposed 10 C.F.R. §50.54(x) would require Commission approval of a licensee's program for funding the management of spent fuel after expiration of the operating license. As we have explained, this proposed funding requirement should be considered together with the similar issues in the decommissioning rulemaking. However, if the Commission decides to address it separately, we recommend that the Statement of Consideration accompanying the proposed regulation reflect the fact that licensees, being in the main public utilities regulated on a cost-of-service ratemaking basis, will likely be permitted to recover the costs associated with extended spent fuel storage through their rates to customers. It is likely that most ratemaking authorities will permit these utilities to recover the estimated future costs of such storage through present rates.[6] In addition, the Commission should recognize that utilities in general have a continuing source of funds through operating revenues and external financing by which they can finance the costs of storing spent fuel.[7] Thus, licensees should face no difficulty in funding the relatively small cost (compared with

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[6] Cf., Boston Edison Company, 21 FERC ¶61,327 (1982), permitting the inclusion in present rates of the estimated costs of permanent disposal of spent fuel.

[7] Single-asset utilities present a unique situation. The question of decommissioning funding by single-asset utilities is currently being considered in the decommissioning rulemaking -- a further reason why the funding aspect of the proposed regulations should be consolidated with the decommissioning proceedings.

the total cost of decommissioning) of extended spent fuel storage, and the Commission should not intrude itself into rate regulation by reviewing proposed methods of cost recovery.

b. Permanent Shutdown Prior to Expiration of License

As one of the reasons for proposing the regulation in question, the Commission states that "some reactors may be permanently shut down prior" to the expiration of the operating license. 48 Fed. Reg at 22731. In our view, this speculative consideration is an inappropriate basis for the proposed regulation because it is essentially irrelevant to the regulation proposed by the Commission. If premature decommissioning occurred, compliance with the proposed regulation may not be possible. The five-year notification requirement of proposed 10 C.F.R. §50.54(x) could not be complied with, and the environmental consequences of the premature shutdown would probably require individual consideration, making the generic determinations underlying the proposed regulation mostly irrelevant. Accordingly, the possibility of premature shutdown should not be invoked as a basis for the regulation.

c. The Requirement for Commission Approval of the Spent Fuel Management Plan

Proposed 10 C.F.R. §50.54(x) would require Commission "approval" of a licensee's spent fuel management plan. It is not clear to us what sort of "approval" is contemplated. In any event, we would suggest that formal approval of the plan is unnecessary. The Commission should instead adopt the practice which it follows in other areas of reviewing the program and alerting the licensee to any problems or deficiencies.[8]

SUMMARY AND RECOMMENDATION

We recommend that the Commission consolidate the proposed 10 C.F.R. §50.54(x) with the current decommissioning rulemaking proceedings. This recommendation is based primarily on the similarity of the issues involved and the absence of any urgency to promulgate the proposed regulation before the decommissioning rulemaking is completed. Should the Commission, however, decide

[8] For example, this is the Commission's practice with respect to physical security plans and safeguards contingency plans required by 10 C.F.R. §50.34(c) and (d).

to address the subject of spent fuel management plans separately from decommissioning, the proposed 10 C.F.R. §50.54(x) should be modified in accordance with these comments.

Sincerely,

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NSR/jf