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Mr. Dwight Shelor, Associate Director
for Systems and Compliance
Office of Civilian Radioactive Waste Management
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Dear Mr. Shelor:

SUBJECT: FORWARDING COPY OF NRC'S SECY-90-051, "STAFF RESPONSE TO OUTSTANDING QUESTIONS ON THE APPLICABILITY OF THE RESOURCE CONSERVATION AND RECOVERY ACT TO A GEOLOGIC REPOSITORY LICENSED UNDER 10 CFR PART 60"

In response to the commitment I made during the May 19, 1994, U.S. Nuclear Regulatory Commission and U.S. Department of Energy (DOE) Management Meeting, to provide DOE with copies of two Commission Papers dealing with the issue of mixed waste and high-level waste, I am hereby enclosing copies of: 1) SECY 90-051, "Staff Response to Outstanding Questions on the Applicability of the Resource Conservation and Recovery Act to a Geologic Repository Licensed Under 10 CFR Part 60," which contains as an enclosure, 2) SECY 89-298, "Applicability of the Resource Conservation and Recovery Act of a Geologic Repository Licensed under 10 CFR Part 60."

If you have any questions, you may contact Michael Lee of my staff at (301) 415-6677.

Sincerely,

Joseph J. Holonich, Chief
High-Level Waste and Uranium Recovery
Projects Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated
cc: See Attached List

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POLICY ISSUE **(Notation Vote)**

February 15, 1990

SECY-90-051

For: The Commissioners

From: James M. Taylor
Executive Director
for Operations

Subject: STAFF RESPONSE TO OUTSTANDING QUESTIONS ON THE
APPLICABILITY OF THE RESOURCE CONSERVATION AND RECOVERY
ACT TO A GEOLOGIC REPOSITORY LICENSED UNDER 10 CFR PART 60

Purpose: To complete the staff response to a Commission request on
the applicability of the Resource Conservation and
Recovery Act (RCRA) to the high-level waste (HLW) program.

Summary: In SECY-89-298, entitled "Applicability of the Resource
Conservation and Recovery Act to a Geologic Repository
Licensed under 10 CFR Part 60" and dated September 22,
1989 (see enclosure), the staff responded to three of
the six questions in Staff Requirements Memorandum (SRM)
COMJC-89-6, dated June 19, 1989 (i.e., Questions 1, 2,
and 6). At that time, it committed to respond to the
remaining three questions (i.e., Questions 3, 4, and
5), as well as as to reevaluate, at a later date, its
June 12, 1986, position on the application of RCRA to
HLW and spent nuclear fuel (SNF).

On December 27, 1989, the staff submitted to the
Commission SECY-89-383 entitled "U.S. Environmental
Protection Agency/U.S. Nuclear Regulatory Commission
Interface Problems." Therein, the staff reevaluated its
June 12, 1986, position on the application of RCRA to HLW
and SNF, and concluded that it agreed with EPA that "...
RCRA applies to any non-radioactive hazardous components
in low-level, transuranic, and high-level wastes." (See
SECY-89-383, Enclosure, p. 33.) SECY-89-383 did not
completely respond to the three open questions in SRM
COMJC-89-6 because the former addressed broad issues
associated with the EPA interface and the staff had yet to
develop a consensus on the response to the three questions.

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Subsequent to the issuance of SECY-89-298 and SECY-89-383, Commissioner Curtiss reminded the staff, by memorandum dated January 4, 1990, to the Executive Director for Operations (EDO), of its commitment to respond to the unanswered questions and to reevaluate its June 12, 1986, position.

In this paper, the staff responds to the remaining three questions. Also, as discussed next and in SECY-89-383, the staff has withdrawn its earlier June 12, 1986, position.

Discussion:

In COMJC-89-6, the Commission asked the staff to set forth, in detail, the basis for its position that HLW and SNF should not be considered mixed waste, even if some small amount of RCRA-listed, chemically hazardous waste is present, on the grounds that the risk posed by the chemically hazardous waste is small in comparison to the radiological hazard of the waste. As noted in SECY-89-298, this staff position was based, because of the lack of data, solely on technical judgment.

In SECY-89-383, the June 12, 1986, staff position was reexamined in consultation with the General Counsel. Based on this reexamination, the staff has subsequently withdrawn its earlier June 12, 1986, position and now believes that RCRA does apply, except to the extent that material in question is "source," "special nuclear," or "byproduct material" (as these terms are discussed here).

Moreover, since the issuance of SECY-89-298, the U.S. Department of Energy (DOE) has published its Environmental Restoration and Waste Management Five-Year Plan (dated August 1989). In this Plan, DOE discusses pre-treatment of certain HLW as the method it generally believes it can use to demonstrate compliance with RCRA. Additionally, DOE believes the steps needed to meet 10 CFR Part 60 will meet or exceed those needed to meet RCRA's requirements. Furthermore, by letter dated December 14, 1989 [letter from Gordon Appel, DOE, to John J. Linehan, U.S. Nuclear Regulatory Commission (NRC); untitled letter on RCRA and the Waste Acceptance Process], DOE has indicated that it is interacting with the U.S. Environmental Protection Agency (EPA) on this matter.

The staff understands that the principal basis for DOE's position, in its Environmental Restoration and Waste Management Five-Year Plan, relative to RCRA rests with the conclusions of EPA's Mixed Energy Waste Study (MEWS). In 1986, EPA formed a MEWS Task Force to evaluate DOE's

proposed option for exempting mixed HLW and transuranic waste (TRU) from RCRA. The Task Force made brief visits to ten DOE facilities, held discussions with seven states where the DOE facilities were located, and conducted a cursory examination of the waste management systems and practices at each facility. These facilities generate and manage all of the HLW and over 95 percent of the TRU waste in the DOE waste stream.

The findings of the EPA MEWS Task Force were issued in March 1987 (see enclosed "Executive Summary") and they concluded that most aspects of DOE's current management practices for mixed HLW and TRU waste, including that of the mined geologic repository, appear equivalent or superior to RCRA requirements for chemically hazardous waste.

Given DOE's initiatives to address the RCRA applicability questions, the staff sees no basis for NRC going beyond a monitoring role of the DOE/EPA interactions at this time.

Before responding to the remaining Commission questions on the applicability of RCRA to the HLW program, it should be understood that the two sets of requirements (NRC's and EPA's) implement two distinctly different regulatory schemes. 10 CFR Part 60 is NRC's regulation governing the disposal of HLW in a geologic repository. This rule establishes procedures for the licensing of the geologic repository and technical criteria for evaluating the merits of the license application for such a purpose. The standards contained in RCRA, on the other hand, are designed to ensure the proper management of chemically hazardous materials from the point of generation to the point of ultimate disposal.

The aforementioned Questions 3, 4, and 5, and the staff responses to them, follow.

Question 3) Would the requirements of [10 CFR] Part 60 result in a level of protection comparable to or greater than that achieved under RCRA, if RCRA were applied to the repository?

Under RCRA, the standard for the protection of human health and the environment from the land disposal of chemically hazardous wastes is that, unless the waste meets certain pre-treatment requirements, it must be demonstrated "...to a reasonable degree of certainty

that there will be no migration of hazardous constituents from the disposal unit as long the wastes remain hazardous." (42 USC 6924(g)(5)) Although the language seems quite clear on its face, its import is emphasized in a March 4, 1986, letter to (the former) EPA Administrator Lee Thomas from several of the legislative sponsors: "... the requirement for proof of 'no migration' is to be interpreted literally.... As indicated earlier, the intent of the [Act's] provisions on land disposal prohibitions is to require treatment prior to land disposal unless it can be proven that untreated [chemically] hazardous wastes or constituent will not migrate from a particular disposal unit. We specifically rejected the concept of an acceptable level of migration because of the scientific uncertainties associated with determining what is an 'acceptable level.' "

By comparison, 10 CFR Part 60 requires "substantially complete containment" of radioactive constituents for a period of 300 to 1,000 years following permanent closure of the repository. After this "substantially complete containment" period, 10 CFR Part 60 recognizes some specified migration of radioactive substances. Although NRC's Part 60 addresses the radiological component of HLW, if the byproduct radionuclides migrate, then it is fair to assume that some nonradioactive constituents will also migrate.

In summary, because RCRA does not permit the migration of chemically hazardous constituents, whereas 10 CFR Part 60 does sanction some releases of radioactive materials following the 300- to 1,000-year "substantially-complete-containment" period, the staff concludes that if the RCRA "no-migration" standard were applied literally to the geologic repository, it would result in a level of protection greater than that afforded by 10 CFR Part 60. However, because of the limited experience with RCRA-licensed disposal sites to date, it would be very difficult to determine whether the actual implementation of RCRA to the geologic repository would afford a greater level of protection than that afforded by the implementation of 10 CFR Part 60.

It should also be noted that because of the actions DOE currently has underway regarding RCRA and HLW and SNF, no additional staff effort should be expended on trying to give a more definitive answer to this question until DOE has completed its work and the staff have had an opportunity to evaluate it.

Question 4) To what extent are the requirements of RCRA inconsistent with the requirements of [10 CFR] Part 60?

An answer to this question rests with what is meant by the term "inconsistent." In an April 11, 1989, memorandum from the General Counsel to the Commission regarding RCRA and the Atomic Energy Act of 1954 (AEA), as amended, the General Counsel construed the term "inconsistent," as it applies to RCRA, to signify not only the physical impossibility of complying with both RCRA and the AEA, but also the situation where compliance with RCRA requirements would be an obstacle to the full execution of NRC's safety responsibilities under the AEA.

Based on this definition and the staff's understanding of RCRA, the staff is not aware of any areas where the requirements of RCRA would be inconsistent with 10 CFR Part 60. However, there has been no evaluation of what it would take to implement the RCRA requirements. Therefore, the staff is not able to say whether the implementation of RCRA would result in any inconsistencies.

Question 5) What are the advantages and disadvantages of defining spent nuclear fuel and high-level radioactive waste as byproduct material, using the "non-elemental definition" set forth in the April 11, 1989, memorandum from the General Counsel to the Commission?

Substantial confusion and uncertainty have surrounded the applicability of RCRA to hazardous wastes containing certain radioactive materials (e.g., "source," "special nuclear," or "byproduct material," as defined by the AEA). This uncertainty stems, to a large extent, from the exclusion of "source," "special nuclear," or "byproduct material" from the definition of "solid waste," under RCRA.

In considering this exclusion, one may examine two approaches to the definition of "byproduct material" that arguably conform to the AEA. The first (non-elemental) is to include, within the scope of the definition, not only the radionuclides produced incident to irradiation in a reactor, but also the nonradioactive medium in which such radionuclides are contained. The second approach (elemental) is to view byproduct material as referring solely to the actual radionuclides and not to the nonradioactive medium.

The selection of one approach or another has a substantial potential effect on the applicability of RCRA, especially with respect to SNF. If the "elemental" definition were to be adopted for SNF, the presence of nonradioactive, possibly hazardous material could require that it be treated as a "mixed" waste subject to RCRA. The consequence would be that facilities for the storage and disposal of SNF might be subject to dual regulation.

It should be noted, however, that under the "elemental" definition, SNF may, in actuality, not prove to be subject to RCRA disposal regulations, since it contains no nonradioactive constituents that appear on EPA's list of RCRA hazardous substances in Subpart D of 40 CFR Part 261. SNF would be considered a "mixed" waste, however, if it exhibited one of the four hazardous characteristics of Subpart C of 40 CFR Part 261, i.e., "ignitability," "corrosivity," "reactivity," or "extraction procedure (EP) toxicity."

At this time, it is not known whether certain substances, principally heavy metals, occur in a chemical form, or in concentrations such that if they would leach out of the spent fuel in sufficient quantity, they would exceed the EP toxicity limits and thus be classified as "RCRA hazardous" wastes. If DOE can demonstrate that the wastes should not be so classified as "RCRA hazardous," then the use of the elemental definition would not be of great significance.

If the "non-elemental" definition were applied to SNF, then the material would not be subject to dual regulation. This is a potential technical advantage of the "non-elemental" definition, because it would eliminate dual regulation without DOE having to demonstrate that the SNF is not subject to RCRA regulations. However, it is now clear that DOE rejects the non-elemental approach, and in fact expressly acknowledges the applicability of RCRA to the nonradioactive hazardous components of the waste substance. See 10 CFR Section 962.3 (and accompanying statement of considerations, 52 FR 15937, May 1, 1987).

A further potential disadvantage of the "non-elemental" definition is that, if it were adopted, enforcement actions initiated by the regulatory authorities on their own or in response to the petition of other parties could give rise to uncertainty and delay, with respect to the national policy of repository development.

As previously noted, DOE has indicated its recognition of its responsibilities to comply with RCRA and is including in its plans the necessary steps to determine the applicability and potential implications of RCRA regulations, with respect to its program. Should DOE determine that actions needed to comply with RCRA have an impact on the design or operation of the repository, the staff anticipates that this would be brought to the attention of NRC in a timely manner, through the established channels of communication.

Recommendation:

In SECY-89-383, the staff identified five possible options for the resolution of EPA/NRC interface problems in the area of HLW and SNF relating to RCRA. These options were:

- 1) Status quo;
- 2) Redefine "byproduct material";
- 3) DOE would submit to EPA a "no-migration" variance petition;
- 4) NRC asserts the inapplicability of RCRA; and
- 5) Congressional exemption of HLW and SNF from RCRA.

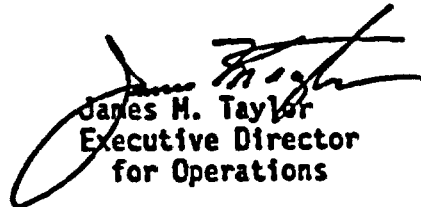
However, as DOE's own rule (10 CFR Section 962.3) rejects the "non-elemental" definition of SNF and HLW, the Commission may wish to consider only Options 1, 3, and 5. Moreover, based on DOE's commitment to work with EPA on RCRA vis-a-vis HLW and SNF, the staff sees no basis for NRC going beyond a monitoring role of DOE/EPA interactions, at this time, and therefore recommends Option 1 for the area of HLW and SNF. In this regard, DOE has indicated it is willing to allow the staff to monitor these interactions.

Coordination:

This paper has been reviewed by the Office of the General Counsel, and there is no legal objection to it.

Note:

In accordance with the recently revised Commission Memorandum on release of SECY papers (dated December 13, 1989, "Commission Internal Procedures -- Public Release of SECY Papers and SRMs"), the staff does not recommend public release of this paper at this time because of the sensitive nature of these issues.


James M. Taylor
Executive Director
for Operations

Enclosures:

1. SECY-89-298
2. MEWS Executive Summary

Commissioners' comments or consent should be provided directly to the Office of the Secretary by COB Wednesday, March 7, 1990.

Commission Staff Office comments, if any, should be submitted to the Commissioners NLT Wednesday, February 28, 1990, with an information copy to the Office of the Secretary. If the paper is of such a nature that it requires additional time for analytical review and comment, the Commissioners and the Secr tariat should be apprised of when comments may be expected.

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September 22, 1989

POLICY ISSUE
(Information)

SECY-89-298

For: The Commissioners

From: James M. Taylor
Acting Executive Director
for Operations

Subject: APPLICABILITY OF THE RESOURCE CONSERVATION AND RECOVERY
ACT TO A GEOLOGIC REPOSITORY LICENSED UNDER 10 CFR PART 60

Purpose: To respond to a Commission request on the applicability
of the Resource Conservation and Recovery Act (RCRA) to the
high-level waste (HLW) program.

Summary: In a Staff Requirements Memorandum (SRM M8900352), dated
June 13, 1989, the Commission requested that the staff
examine the regulatory initiatives of the U.S.
Environmental Protection Agency (EPA) and assess their
impact on the Commission's regulatory programs. To
support this request, an interoffice task force has
been formed and is scheduled to report to the Commission
in December 1989 with its findings and recommendations.

In a second SRM (M8900360) dated June 19, 1989, the
Commission requested that the staff set forth, in detail,
the basis for the staff's June 12, 1986 position that
HLW and spent nuclear fuel (SNF) should not be considered
mixed waste. In this second request, the Commission asked
the staff to address six specific questions on the
EPA-promulgated RCRA regulations and their application to
a geologic repository licensed under 10 CFR Part 60.

The interoffice task force intends to re-evaluate the
June 12, 1986 staff position. For several of the questions
raised in SRM M8900360 (e.g., Question Nos. 3, 4, and 5),
substantial time and effort will be required in order for
the staff to evaluate and respond to the questions. The
staff proposes to consider these questions in its response
to the Commission on SRM M8900352.

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With respect to Question Nos. 1 and 2, there is not a sufficient technical basis on which to form a conclusion, at this time. Finally, with respect to Question No. 6, the staff has not held any meetings with EPA to specifically discuss the application of RCRA to the HLW program.

Background:

In SRM M8900360 dated June 19, 1989, the Commission expressed its interest in resolving, as early as possible, whatever ambiguity might exist about whether EPA's RCRA regulations will apply to a geologic repository licensed under 10 CFR Part 60, if the waste disposed of there contains some amount of a hazardous substance. Previously, in a June 12, 1986 memorandum from the Executive Director for Operations (EDO) to Commissioner Bernthal, the staff had taken the position that HLW and SNF should not be considered mixed waste, even if some small amount of RCRA-listed hazardous waste is present there, on the grounds that the risk posed by the hazardous waste is small in comparison to the radiological hazard of the waste. In the June 19, 1989 SRM, the Commission noted that the staff position is inconsistent with the EPA position that RCRA will apply if there is any hazardous component in waste disposed of in a repository, regardless of further subclassification of the radioactive waste constituent as high-level, low-level, or greater-than-class-C, etc.

The applicability of the RCRA rules to the HLW program is just one of several outstanding issues concerning EPA's radiation-related regulations. In SRM M8900352, dated June 13, 1989, the Commission expressed an interest in understanding where problems are occurring between NRC's and EPA's regulations, as well as the policy options available to the Commission that might promote cooperation between the two agencies.

To address SRM M8900352, the Director of the Office of Nuclear Material Safety and Safeguards convened an interoffice task force in early August 1989. The interoffice task force plans to brief the Commission on its findings and recommendations for resolving the regulatory differences between the two agencies. This briefing is scheduled to be held in December 1989.

In response to SRM M8900352, the interoffice task force intends to re-evaluate the staff position taken in the June 12, 1986 memorandum from the EDO to Commissioner Bernthal on the non-applicability of RCRA to HLW and SNF.

In addition to resolving the inconsistencies between NRC and EPA staffs' positions on the applicability of RCRA to the HLW program, the Commission requested, in SRM M8900360, that the staff provide answers to six specific questions. Accordingly, this memorandum provides background information, to the extent practicable, on three of the questions posed by the Commission. As previously noted, the staff's June 12, 1986 position on the applicability of RCRA to HLW and SNF will be re-evaluated as part of the broader task force presentation planned for later this calendar year. In addition, the staff proposes to consider the remaining three questions as part of the task force's effort.

Discussion:

In SRM M8900360, the Commission asked the staff to set forth in detail the basis for its position that HLW and SNF should not be considered mixed waste, even if some small amount of RCRA-listed hazardous waste is present there, on the grounds that the risk posed by the hazardous waste is small in comparison to the radiological hazard of the waste. This staff position was taken because the quantities of hazardous constituents are believed to be small relative to the total quantity of radioactive constituents in HLW and SNF and because the relative risks were believed to be commensurate with the amounts of constituents in question. At that time, as now, the staff knew of no data base on which to draw any quantitative conclusions. Thus, the staff position was based solely on technical judgement.

The Commission asked six specific questions concerning the applicability of RCRA to the HLW program. These questions and the staff responses are as follows.

- 1) What RCRA hazardous substances are present in spent nuclear fuel and high-level radioactive waste?

There is little relevant information concerning the nonradiological chemical characterization of HLW and SNF. The staff is not able to state with any degree of certitude, therefore, which RCRA-listed hazardous substances (principally heavy metals) may be present or which are in need of characterization. In particular, without having information on leach rates for heavy metals in a given waste form, it is not clear if the heavy metals in question would exceed the background concentration limits permitted by RCRA and thus be classified as "RCRA hazardous wastes."

In 1987, EPA conducted a study known as the "Mixed Energy Waste Study (MEWS)," in order to evaluate a U.S. Department of Energy (DOE) proposal in which current and future mixed HLW and transuranic waste would be exempt from the requirements of a hazardous waste program. As part of the study, EPA visited 10 DOE facilities in an attempt to understand DOE's hazardous waste management practices. In addition to the DOE facility visits, EPA also examined DOE's programs analyzing the composition of hazardous wastes. EPA concluded that the chemical analysis of HLW had "been minimal" at DOE facilities and apparently had been limited to characterization in terms of radioactive constituents rather than by chemical composition. Thus, the question about whether or not the wastes considered in the MEWS study contain hazardous constituents, for the purposes of RCRA, remains unresolved by DOE.

- 2) How does the risk to the public posed by these hazardous substances compare to the risk posed by the radioisotopes in the waste?

The staff is not aware of any studies that compare the two hazards and assess their relative risks. Such a comparison would first require better chemical characterization of HLW and SNF. NRC has traditionally been concerned with radiological rather than nonradiological hazards and thus has not developed independent information on which to base a response.

It is the staff's understanding that DOE is performing work relative to Question Nos. 1 and 2 above. However, because of the preliminary nature of this work, DOE has not yet released any results. As part of its ongoing work, the staff will begin to raise these issues with DOE in order to focus the Department on the types of assessments needed to evaluate the concerns posed by Question Nos. 1 and 2. In addition, the staff will keep abreast of and evaluate DOE's work once it becomes available.

- 3) Would the requirements of Part 60 result in a level of protection comparable to or greater than that achieved under RCRA, if RCRA were applied to the repository;
- 4) To what extent are the requirements of RCRA inconsistent with the requirements of Part 60; and

- 5) What are the advantages and disadvantages from a technical standpoint of defining spent nuclear fuel and high-level radioactive waste as a byproduct material, using the "non-elemental definition" set forth in the April 11, 1989 memorandum from the General Counsel to the Commission?

Substantial staff time and effort will be required to evaluate and respond to Question Nos. 3, 4, and 5. The staff proposes to consider these questions in its response to the Commission on SRM M8900352, which is currently scheduled for December 1989.

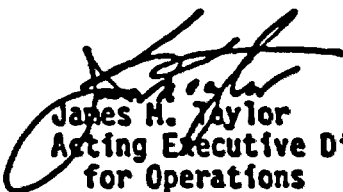
- 6) What meetings has the staff had with EPA on this issue?

The staff has not held any meetings with EPA to specifically discuss the application of RCRA to the HLW program. RCRA-related issues have been raised periodically at NRC/EPA interactions. However, these issues have not been focused on the area of HLW and SNF. The discussions with EPA have concentrated on mixed waste aspects of low-level waste disposal, where joint NRC/EPA regulatory guidance is being developed. As noted above, the EPA is interacting directly with DOE on mixed high-level and transuranic waste and the NRC staff is following that interaction.

Coordination:

The General Counsel, with whom this paper has been coordinated, notes that although the legal issue concerning the classification of HLW and SNF as mixed waste will be re-evaluated by the interoffice task force, pertinent considerations have been addressed by the General Counsel's memorandum for the Commissioners, dated April 11, 1989, entitled "RCRA and the Atomic Energy Act."

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James M. Taylor
Acting Executive Director
for Operations



MIXED ENERGY WASTE STUDY (MEWS)

March 1987

**U.S. Environmental Protection Agency
Office of Solid Waste and Emergency Response
401 M Street, S.W.
Washington, DC 20460**

EXECUTIVE SUMMARY

"Radioactive mixed waste" has both radioactive and hazardous chemical properties. Many Department of Energy (DOE) facilities generate or manage radioactive mixed waste, as well as non-radioactive hazardous waste.

In November, 1986, DOE informally proposed an option for the Environmental Protection Agency (EPA) in which current and future mixed high-level radioactive waste (HLW) and transuranic (TRU) waste would be exempted from the hazardous waste control program under Subtitle C of the Resource Conservation and Recovery Act (RCRA). While this proposal may deregulate the hazards associated with both wastes, the DOE contends that controlling radiation hazards from HLW/TRU waste also controls chemical hazards. In response, EPA formed the Mixed Energy Waste Study (MEWS) task force to evaluate DOE's proposed option. The purpose was to compare DOE's practices to requirements for hazardous waste management under RCRA Subtitle C.

From November, 1986, to February, 1987, the task force analyzed the current DOE management practices for HLW, TRU, and certain other radioactive wastes. This report summarizes the findings of the task force.

This Executive Summary provides:

- a brief definition of high-level and transuranic wastes and their sources.
- a description of current management practices for such waste at DOE facilities.
- a summary of DOE's proposed option for waste management at DOE facilities.
- State government perspectives on the proposed option.
- findings of the MEWS task force.

The MEWS task force concluded that, with some exceptions, current DOE management of mixed HLW/TRU waste is equivalent or superior to RCRA requirements. In other words, management of these wastes would not change significantly if they were required to comply with RCRA Subtitle C requirements for hazardous waste. However, there were a few aspects which probably would not meet RCRA standards.

Most States were concerned about DOE self-regulation of HLW/TRU waste (DOE option), but were willing to consider case-by-case variances or specific exemptions.

A. HIGH-LEVEL AND TRANSURANIC WASTE:

High-level radioactive waste results from the processing of nuclear reactor fuels. One type results from dissolving nuclear reactor fuel elements to recover plutonium. Another results from dissolving naval reactor fuel elements to recover enriched uranium. When formed, HLW is highly acidic ($\text{pH} < 1$) and highly radioactive. It contains many fission products and some transuranic elements. Most HLW has hazardous chemical characteristics (corrosivity and toxicity), and may also contain listed RCRA hazardous wastes. Even so, its hazard is due primarily to its intense radioactivity.

When generated, HLW is in liquid form. As a result of treatment, however, it can become a sludge or slurry. It must be remotely handled and contained prior to disposal. HLW is currently stored in double-walled steel, underground tanks. At the Idaho National Engineering Laboratory (INEL), the HLW is further processed via high-temperature flash evaporation into a solid, calcined, sand-like material which is stored in shielded above-ground bins or silos. At the Savannah River Plant, a new \$1 billion HLW vitrification (glass) plant is about 50 percent complete and a similar facility is planned for the Hanford site, although it is not yet funded. The vitrified HLW will be solidified and stored inside large stainless steel cylinders. Ultimately, these cylinders will be permanently disposed of in a future High Level Waste Repository which will accept both DOE and commercial HLW.

By definition in EPA's Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-level and Transuranic Radioactive Wastes (40 CFR 191), transuranic (TRU) waste is waste containing alpha-emitting transuranic isotopes with half-lives greater than 20 years and containing more than 100 nanocuries per gram (NCI/G) of waste. TRU waste arises mostly from the processing, shaping, and handling of plutonium-containing materials. Most TRU waste is solid (e.g. gloves, rags, and tools), but some is liquid. Some TRU waste contains listed RCRA hazardous waste such as spent cutting oils or solvents. A small amount of TRU waste is classified. At the Oak Ridge National Laboratory (ORNL), a highly radioactive isotope of uranium (U-233) is also managed with and considered to be TRU waste.

At most facilities, TRU waste is triple-packaged. First, it is sealed in a plastic bag. The bag is then placed in a plastic drum inner liner which in turn is placed in a steel drum or box. This packaging usually provides sufficient shielding because most plutonium isotopes are mainly alpha-particle emitters which are primarily hazardous when inhaled or ingested. Alpha-particles are easily stopped by almost any barrier, and as a result, the radiation level at the surface of the drum or box is relatively low. This type of waste is called "contact-handled" TRU (CH-TRU).

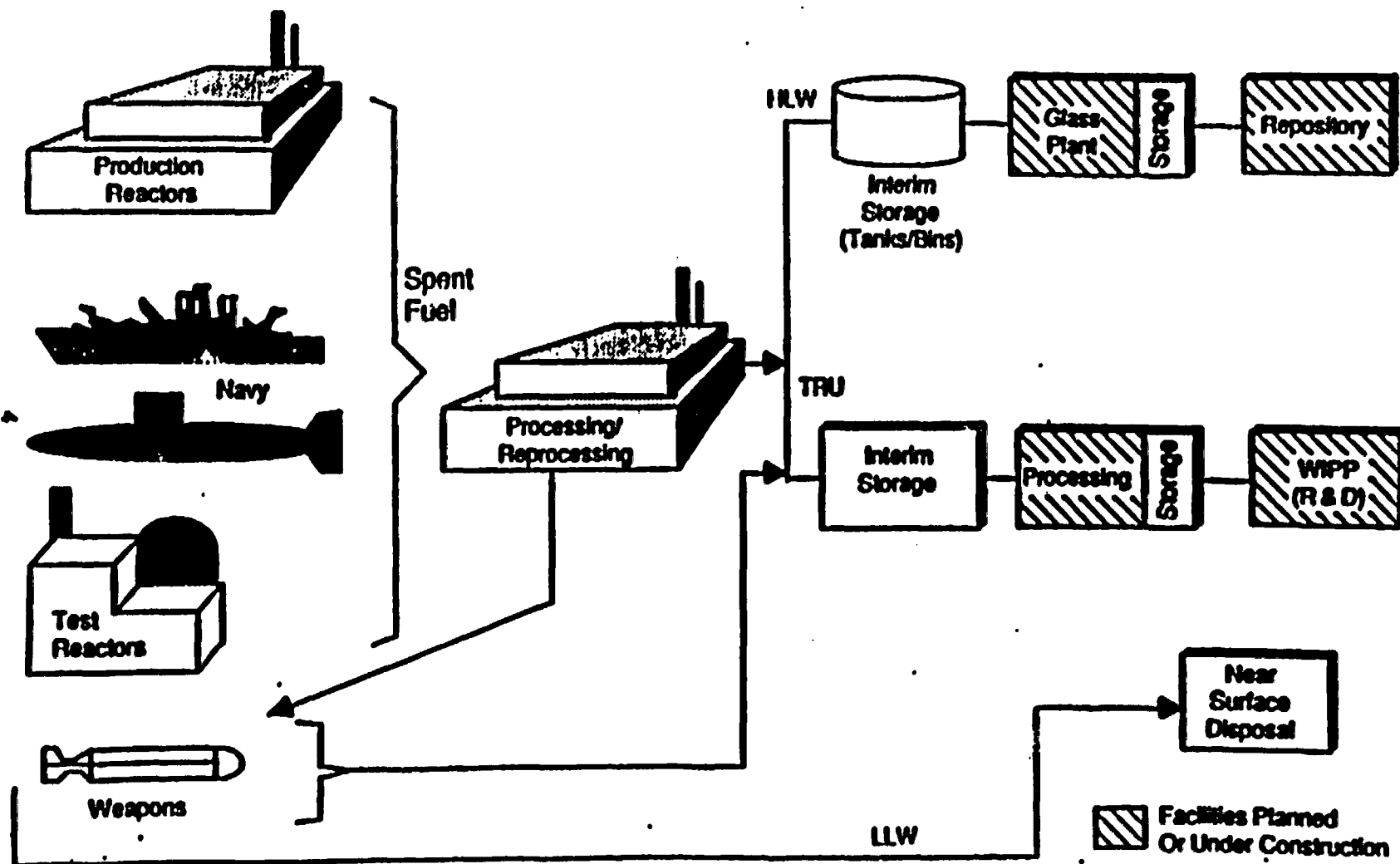
Some TRU waste, however, also contains beta- and gamma-ray emitters. These wastes must be handled remotely if the radiation level at the surface of the drum or box exceeds 200 millirems/hour (mrem/hr). This type of waste is called "remote-handled" TRU (RH-TRU).

Since 1970, DOE has stored its TRU waste in drums or boxes in earth-covered trenches or in above-ground mounds. Waste stored at these sites is called "retrievable TRU waste". In recent years, some DOE sites have started storing TRU drums or boxes on open concrete pads or in air-inflated or steel-hoop buildings. Ultimately, most stored (and newly generated) unclassified TRU waste will be disposed of at the Waste Isolation Pilot Plant (WIPP), an excavation in a salt deposit 2,100 feet below ground near Carlsbad, New Mexico.

Classified TRU waste, however, is disposed of at the Nevada Test Site (NTS). TRU may be classified because of its shape or form; its isotopic, chemical, or alloy composition; or because the waste contains tools that may be classified. All classified TRU waste is solid (such as graphite, steel, or plastic) and does not contain known RCRA hazardous chemicals. Classified TRU waste was disposed in unlined shafts 10 feet wide and 120 feet deep. DOE refers to this practice as greater confinement disposal (GCD). Disposal of TRU waste in GCD shafts is currently suspended pending DOE demonstration of compliance with 40 CFR 191.

Sources and general management schemes for HLW and TRU waste are shown in Figure ES-1. Low-level radioactive waste (LLW) also arises from the same sources, but is handled differently. LLW is outside the scope of this study.

FIGURE ES-1
SOURCES AND DISPOSITIONS OF RADIOACTIVE WASTE



B. DOE'S PROPOSED OPTION FOR HLW/TRU WASTE MANAGEMENT:

On November 1, 1985, under the Atomic Energy Act (AEA), DOE proposed in the Federal Register a definition of the term "by-product material" as it pertained to DOE activities under RCRA. Precise definition of the term is important because "by-product material" is excluded from the RCRA statutory definition of solid waste and, therefore, from regulatory control under the RCRA Subtitle C hazardous waste program. DOE's proposed definition was based on the process from which a material is produced rather than defining the chemical by its intrinsic properties. Under the proposal, all mixed HLW and TRU waste, as well as some mixed LLW be excluded from RCRA control.

In March 1986, DOE initiated a policy review of the proposed "by-product material" rulemaking, including an exploration of other options.

In early November, 1986, DOE informally proposed that EPA evaluate an option to the "by-product material" rule. The option was based on the premise that controlling radiological hazards from HLW and TRU waste also manages their chemical hazards in a manner equivalent or superior to RCRA hazardous waste controls. DOE's proposed option had the following elements:

- LLW mixed waste would be subject to RCRA regulations.
- Current and future HLW and TRU waste would be exempted from RCRA Subtitle C control via EPA rulemaking [Note: while past disposal practices would be subject to RCRA as Solid Waste Management Units (SWMUs), and NEPA, the AEA, and RCRA Subtitle I (Underground Storage Tanks) would still apply. This rulemaking requires finding inconsistency with the AEA under RCRA Section 1006].
- State laws would not apply to HLW/TRU Waste.
- DOE would make an annual report to EPA on HLW/TRU waste management; EPA could verify the report's findings via site visits.
- DOE would revise its internal waste management directives to make them consistent with RCRA regulations.
- Certain other radioactive wastes would also be exempt from RCRA and State control. (DOE has identified uranium-233 contaminated waste and decommissioned submarine reactor compartments in this category.)

In response to DOE's proposed option, EPA formed the Mixed Energy Waste Study (MEWS) task force. The project involved visits to 10 DOE facilities and discussions with seven State governments where DOE facilities are located.

The major facilities affected by DOE's proposed option and the states and facilities visited by the MEWS task force are shown in Figure ES-2.

C. STATE PERSPECTIVES:

The MEWS task force discussed the DOE option with personnel from the states of California, Colorado, Idaho, New Mexico, South Carolina, Tennessee, and Washington. Each State is directly concerned with current and future oversight and regulation of DOE facilities within their borders.

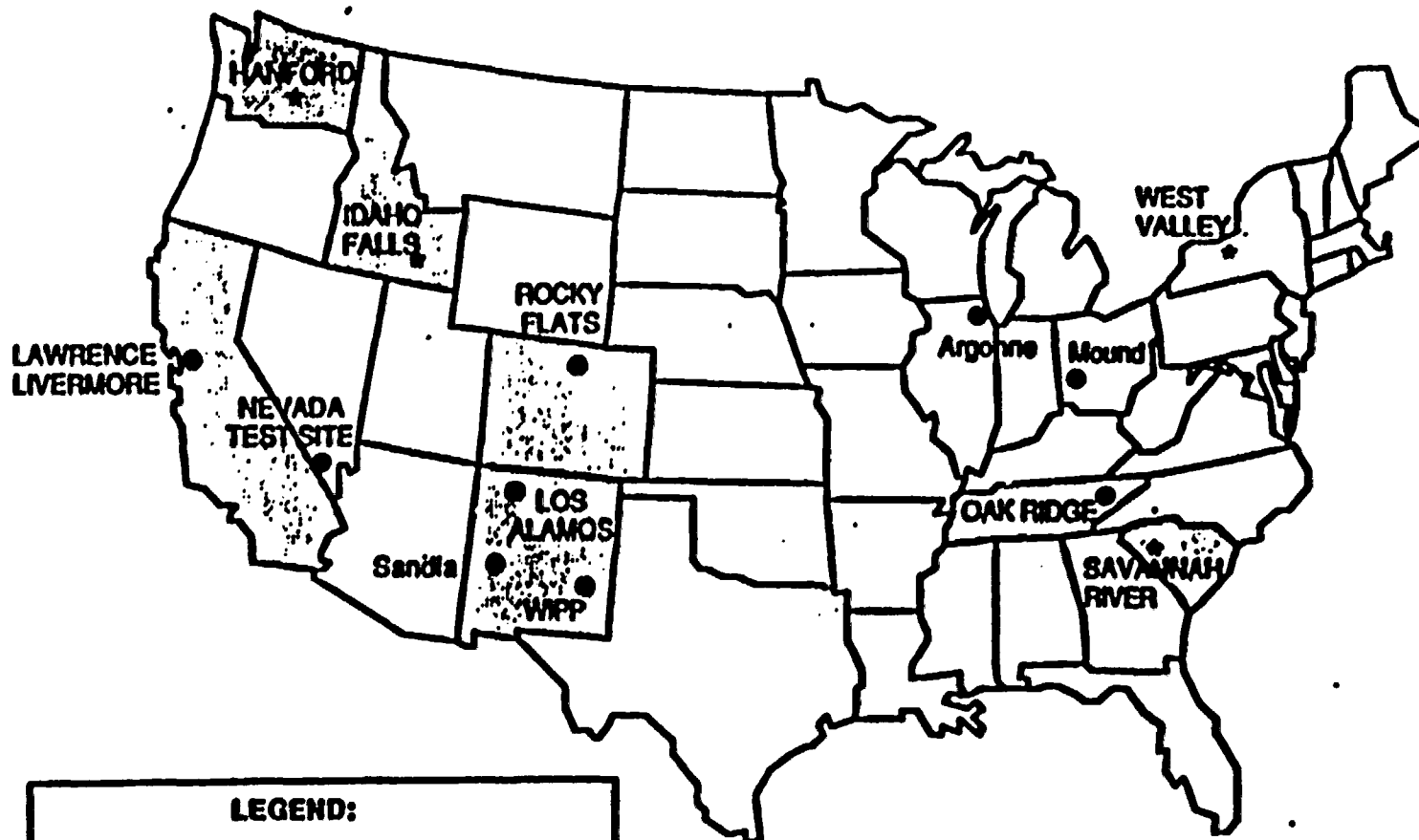
The States response to the DOE option varied from strong opposition to mild reservations. A consensus of State opinions is as follows:

- DOE/EPA/States must reach agreement on the precise definition of terms and their application to specific wastes at specific facilities. Arbitrary definitions and "moving targets" have caused past problems.
- States want more control and oversight of DOE facilities. They are concerned about DOE self-regulation of HLW/TRU waste because of past problems.
- States are willing, however, to consider specific variances or limited exemptions for HLW/TRU waste where warranted.
- Most States are concerned about the resources and technical skills needed to control HLW/TRU waste, but some are willing to prepare to meet the challenge.


D. MEWS FINDINGS:

The MEWS task force findings concerning DOE's current management of HLW and TRU waste are summarized below. These findings are based on brief visits to the ten DOE facilities that generate and manage all the HLW and over 95% of the TRU waste in the DOE system. In-depth visits might uncover other details but most likely would not change the overall

**FIGURE ES-2
MAJOR FACILITIES AFFECTED BY DOE OPTION**



LEGEND:

-  State Contacted by MEWS Task Force
- TRU Waste Only
- ★ HLW/TRU Wastes
- WPP Sites Visited by MEWS Task Force
- Mound Site Not Visited by MEWS Task Force

impressions of the task force. These findings do not apply to DOE's past management practices. Reviews of HLW/TRU waste management at each of the ten DOE facilities are presented in the main report. More detailed visit reports for each facility and each State are provided in Appendices A and B respectively.

The MEWS task force findings include the following:

A. HLW/TRU WASTE MANAGEMENT IS COMPLEX.

- HLW/TRU wastes arise from numerous, variable sources and are managed in many different ways.
- Definitions of terms are not universally consistent.
- There are four different categories of TRU waste; each is managed through different methods.

B. TRU WASTE IS OFTEN MANAGED WITH LLW AND WITH RCRA HAZARDOUS WASTE.

- TRU waste management is not a separable problem.
- Old HLW/TRU waste management sites are RCRA SWMUs.

C. THE HLW/TRU WASTE SYSTEM DEPENDS HEAVILY ON FUTURE ACTIONS.

- HLW repository.
- Vitriification plants (Hanford, Savannah River, West Valley).
- WIPP operation/expansion.
- RH-TRU waste processing facility at Oak Ridge.

D. THERE ARE SPECIAL CASES THAT DO NOT FIT THE "NORMAL" MANAGEMENT SCHEME

- Submarine reactor compartments.
- Classified TRU.
- TRU waste unacceptable at the WIPP.

E. MOST DOE PRACTICES FOR HLW/TRU WASTE SEEM COMPARABLE TO RCRA STANDARDS, AND SEVERAL PRACTICES SEEM SUPERIOR TO RCRA REQUIREMENTS.

- Security.
- Contingency plans and emergency response.

- Continuous control of HLW tank systems.
- Waste tracking systems and documentation.
- WIPP deep containment for TRU waste (future).
- Deep repository for HLW (future).

F. SEVERAL ASPECTS PROBABLY WOULD NOT MEET RCRA STANDARDS

- Chemical analysis of waste.
- Ground-water monitoring systems.
- Retrievable storage for TRU waste.
- Classified TRU waste disposal.
- Self-inspection.

G. RCRA VARIANCES OR PROPOSED SUBPART X COULD APPLY TO SOME ASPECTS, BUT CASE-BY-CASE EVALUATION IS NECESSARY.

RCRA variances may be applicable to some aspects noted above, such as waste analysis or ground-water monitoring requirements. Each facility, however, must be evaluated on a case-by-case basis before variances can be granted. The new RCRA Subpart X regulation may provide a mechanism by which unusual management options could be evaluated separately for each facility or for new facilities or treatment units. Examples of possible application of proposed Subpart X include the WIPP and the HLW vitrification plants.

H. CURRENT MANAGEMENT WOULD NOT CHANGE SIGNIFICANTLY IF HLW/TRU WASTE WERE CONTROLLED UNDER RCRA.

The general management of HLW/TRU waste at DOE facilities would not change significantly if the facilities were subject to RCRA Subtitle C hazardous waste controls. Areas that would need to be addressed through improved practices or case-by-case variances include chemical analyses ~~include chemical analyses of water~~, ground-water monitoring, and independent oversight.